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Advances and New Perspectives

Edited by Sayed Hemeda

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Meet the editor

Professor Sayed Hemeda obtained his Ph.D. in Civil Engineering from the Aristotle University of Thessaloniki, Greece, specializing in Architectural and Structural Conservation of Built Heritage. He was the first Head of the Architectural Conservation Department at the Faculty of Archaeology, Cairo University, Egypt. Previously, he served as Manager of the Heritage Science Program and Centre (LACC) at the Egypt-Japan University of Science and Technology (E-JUST) and as Vice Manager of the Conservation Center of Historic Buildings and Artifacts at Cairo University. A highly ranked scholar, Professor Hemeda has been placed in the top 0. 03% of researchers worldwide by ScholarGPS and is ranked #7 in archaeology globally. He has received numerous awards from Cairo University, including the Scientific Excellence Prize (2017), the Encouragement Award (2014), and the Best Ph.D. Thesis Award (2009–2010). In 2019, he was also honored with the General Union of Arab Archaeologists Prize for Academic Excellence. His research output includes 45 articles in Q1 journals indexed in Scopus and Clarivate, 37 international books published by Springer, Bentham, and IntechOpen, and 430 citations. He has delivered 58 invited lectures across 16 countries. Professor Hemeda's primary research interests lie in geotechnical and structural engineering applications for architectural heritage preservation and engineering data analysis, particularly in pattern recognition for analytical data from culturally significant objects. He is the Editor-in-Chief of the Journal of Advances in Geological and Geotechnical Research and serves on the editorial boards of several publications, including Springer Nature, IntechOpen, Bentham Books, the Open Journal of Geology, Progress of Electrical and Electronic Engineering, Geoscience Journal, and Alexandria Engineering Journals. Additionally, he is an Editorial Board Member of NPJ Heritage Science.

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Preface

The book sheds light on recent advances and new perspectives in safeguarding and preserving the world's natural and tangible cultural heritage, emphasizing modern protection strategies and techniques. This book emphasizes the importance of the applications of advanced conservation materials and technology, particularly the application of nanotechnology and biotechnology in improving and conserving built heritage materials and museum artefacts. Also, it represents the applications of heritage science, including the data analysis and utilization of modern micro and macroscopic characterization of heritage materials and their roles in the rescue and protection of underground and above-ground built heritage. This book covers in detail the UNESCO World Natural and Culture properties (Tangible and Intangible cultural heritage) and sustainability problems of various cultural heritage, including building stones, mud and fired clay bricks, timber, cementitious materials, sand, lime, gypsum mortars, concrete, and so on. Also, conservation materials like basalt, glass, and carbon fiber-reinforced polymer will be addressed. The manufacture, properties, uses, advantages and disadvantages, nano-destructive testing, and evaluation of each material will be discussed. The book will discuss, in detail, the modern techniques in archaeological excavations and museum management and also shed light on the recent advances in the recording and monitoring techniques of the heritage sites and microclimate control in museums, and the AI in archaeology, conservation projects, and risk assessment.

This book includes two sections with 12 chapters from 12 countries with various topics and titles:

Section 1, entitled "Conservation Planning and Management of Built Heritage", starts with Chapter 1: "Modern Heritage Buildings in Selected Universities in Bulacan: An Identification and Documentation for Protection".

Chapter 2: "Contribution of Geospatial Data in the Mapping and Restoration of Sacred Forest in the Grassfield Communities in Cameroon".

Chapter 3: "Developing a New, Effective Approach to Safeguarding Cultural Heritage Following the Normalization of Relations between Belgrade and Pristina".

Chapter 4: "Thermal Weathering and Assessment of Marble Stones in Heritage Structures".

Chapter 5: "The Heritage Destruction of Manila: Cultivating a Heritage-Driven Economy for the City of Manila".

Chapter 6: "Conceptualizing Historic Preservation Planning with Curatorial Management through a Critical-Educational Conceptual Framework".

Section 2, entitled "Archaeological Fieldwork and Tourism Strategies for Cultural Heritage", includes Chapter 7: "Architectural Icons and Intellectual Beacons: Ibb City's Islamic Schools and Omar's Mosque – A Great Loss to the Islamic Heritage".

Chapter 8: "Enhancing Educational and Tourism Strategies at Heritage Sites: Visitor Flow Prediction Using ARIMA and Autoregressive Models".

Chapter 9: "Integrating Agent-Based Simulations with Archeological Fieldwork through Log-Data Analysis".

Chapter 10: "Croatian Glagolitic Heritage: Elements and Contemporary Communication Practices".

Chapter 11: "Wool Clothes and Mats in the Bronze Age and Medieval Burials in the Northern Caucasus Region".

Finally, Chapter 12: "Metal Cultural Treasure of the Ottoman: Talisman Seals".

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Section 1

Conservation Planning and Management of Built Heritage

Chapter 1

Modern Heritage Buildings in Selected Universities in Bulacan: An Identification and Documentation for Protection

Dennis L. Estacio

Abstract

The province of Bulacan is rich in historic places and heritage buildings and recognized public and private educational institutions, such as Bulacan State University (1904) and La Consolacion University Philippines (1937). This study aims to properly identify and document the university buildings built from 1945 to 1986 as modern heritage. To pursue the objective, the researcher conducted documentation procedures, archival research, and literary review. Photo documentation in assessing the current physical conditions of the buildings determined as modern heritage in selected universities. Mapping and inventory were used to gather necessary information on the modern heritage buildings relevant to the study. La Consolacion University Philippines campus in Barangay Catmon has one identified Modern Heritage Building, the Mo. Rita and Mo. Consuelo two-storey buildings, initially constructed as two identical parallel buildings as the very first structure built in early 1986, designed by local Architect Leonides Manahan. Bulacan State University, on the other hand, has a three-storey building named after Federizo, which was built in 1971 by an unknown designer. Both buildings are estimated to be 36 and 51 years old and characterized by massive concrete and steel structure with embellished massive concrete parapets.

Keywords: modern heritage, Bulacan Universities, identification, documentation, protection

1. Introduction

Modern heritage is defined by UNESCO as "architecture, town planning, and landscape design of the 19th and 20th centuries" in its 2003 identification and documentation of modern heritage documents. These buildings serve as a reminder of an era characterized by unmatched technological and socioeconomic development that occurred quickly. It is challenging to connect a contemporary structure with legacy

because heritage is typically associated with aging, severely damaged structures composed of materials like stone or brick [1]. Structures constructed between 1945 and 1986 are referred to as modern heritage structures.

It can be challenging to assess a structure's value due to the prevalence of concrete and steel buildings in our environment; this is demonstrated by the underrepresentation of these buildings in the World Listing for Modern and Industrial Heritage [2].

But nowadays, repairing and renovating old structures so they can be used again is a creative task [3, 4]. 'Adaptive reuse' is the term used to describe the process of completely altering a structure [5]. Adaptive reuse is viewed as an important technique for the conservation of cultural assets according to contemporary conservation theory and practice [6, 7]. However, in this study, the application of adaptive reuse will not be the focus. This study will focus on identifying and documenting for protection of the existing modern heritage in selected universities in Bulacan, specifically in Malolos.

The modern heritage program attempts to create a conceptual framework for thinking about the value of modern heritage, its preservation, and some of the most important difficulties surrounding identification and valorization. This framework is being created as a result of the numerous regional meetings on modern heritage that the World Heritage Center has organized in several parts of the world. Various meetings have been conducted to make it easier for the organization in question to conduct additional, more detailed research and exercises for the purpose of preservation.

There are many historical sites and heritage structures in the Philippines, particularly in Bulacan, which is located in the southernmost part of the fertile plains of Central Luzon. Numerous nationally renowned public and private educational institutions, including Bulacan State University (1904) and La Consolacion University Philippines (1937), are located in the province. Buildings on university campuses serve as both repositories for local historical artifacts and examples of contemporary Bulacan architecture.

1.1 Statement of the problem

To be able to protect modern heritage sites from destruction or harm brought on by improper protection planning, identification, and documenting of these structures must be conducted continuously. Many of its advantages may only be attained by persistently updating the crucial data and comparing it across time. As a potential result, there is a need to properly identify, document, record, and consolidate university buildings in Bulacan that have been designated as modern heritage buildings. This is done in order to identify and document these buildings as important examples of modern heritage and to protect them from obstructive modification and alteration that could change their architectural character.

1.2 Objectives of the study

- To accurately identify and document the universities in Bulacan's modern heritage structures.
- To inform the stakeholders of the data collection and needs analysis processes. These stakeholders—university owners, professors, nonteaching, parents, barangay and municipal governments, and civil societies—play a significant part in the

advocacy mentioned above, thus it is vital to confer with and solicit input from them.

- To create baseline data for cultural statistics and to create a consolidated local culture profile for the protection of designated Modern Heritage University Buildings.

- Considering and incorporating Modern Heritage Building profiles and baseline data into plans, programs, and activities for integrated campus development.

1.3 Scope of the study

The existing university buildings that have been identified as modern heritage structures will be covered by the study. The investigation will only cover universities with structures that have been classified as modern heritage buildings and were constructed between 1945 and 1986 as defined by UNESCO. Important information, including historical details and architectural design will feature what characterizes modern heritage buildings. The study also documented the recognized modern heritage structures based on the testimonies of the interviewees and the verified supporting documents on university campuses. Other well-known universities in the region were not included in the study.

2. Methods

The researcher employed the detailed narrative descriptive method to complete the study. This research approach provided thorough documentation and detailed descriptions of modern heritage locations, artifacts, and even practices. This includes recording the subject's present condition as well as its physical attributes and historical background. The researcher carried out field notes, cataloging, and archiving methods to further achieve the goal. Archival resources were reviewed to establish the historical context. Pertinent documents such as the master development plan, campus physical development plan, inventory records of building facilities, ongoing projects and developments, and other related documents were gathered and reviewed by the University administrators. The past, present, and future development of physical campus development plans were investigated and put into consideration. The physical state of the historic buildings on the campuses was evaluated using photo documentation, and each image was appropriately labeled. Necessary permissions were secured, and informed consent forms during the interviews and onsite visits were also secured. Confidentiality of records and documents was observed.

3. Results and discussion

3.1 La Consolacion University Philippines

3.1.1 Barasoain Campus

The La Consolacion University Philippines (formerly the University of Regina Carmeli) Barasoain Campus is one of the 21 schools of the Augustinian Sisters of Our

Lady of Consolation and was founded in 1937. It has a total land area of .2 hectares equivalent to 2645 square meters with a total building floor area of 4225 sq. mts. The La Consolacion University Philippines located right beside the Historical Barasoian Church is formerly known as Colegio de Nuestra Seňora del Carmen. The building is made up of light-weight materials from its humble beginning and gradually developed through the years.

3.1.1.1 Barasoain Campus site development plan

La Consolacion University Philippines still exists up to this date and is made up of three major buildings of concrete structures (**Figure 1**).

Administrators of the university are crafting proposals for physical development are being developed to provide a conducive learning environment (**Figure 2**).

3.1.1.2 Barasoain Campus physical discription

A. St. Joseph building.
Location: Sikatuna St, San Gabriel, Barasoain,
Malolos City, Bulacan.
Architect: Tomas N. Morallo.
Owner: Augustinian Sisters of Our Lady of Consolation.
Use: Senior High School Building (**Figure 3**).
Land Area ... 2526 sq.m.
Bldgs. Floor Area ... 4225 sq.m.
% of Land Occupied by the Bldg... ..82.65%.
Remaining Space....17.35%.
Condition: Good.

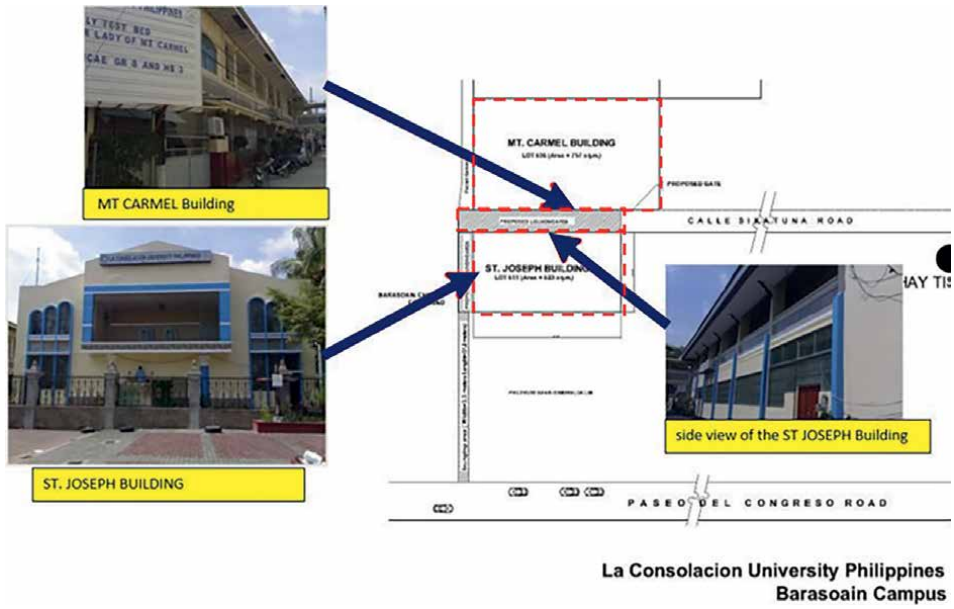

Figure 1.
The buildings were named into three, namely the Sacred Heart Building, Mt. Carmel, and St. Joseph.

Figure 2.
The Architect's rendition of aerial development plan with the proposed development plan.

Figure 3.
St. Joseph Bldg. 2010.

Source: Sr. Carmeli Marie Catan, OSA.
-1st University President (21 years as President) (**Figure 4**).

3.2 Catmon Campus

The La Consolacion University Philippines Catmon Campus is the second campus that was built during the 1980s. It has a total land area of more than 5 hectares equivalent to over 50,000 square meters. Significant physical development happened since

Figure 4.
St. Joseph Bldg. 20,216.

the lot was purchased. The very first structure that was constructed in the Mother Rita and Mother Barcelo two-story buildings.

3.3 Catmon campus site development plan

See **Figure 5**.

Figure 5.
La Consolacion University Philippines-Catmon campus physical development.

3.4 Mo. Consuelo and Mo. Rita building as identified modern heritage structure

Mother Consuelo and Mother Rita are the very first two structures made up of concrete. It was named after the foundresses of the Augustinian Sisters of Our Lady of Consolation, Mother Rita and Mother Consuelo. The building initially housed the elementary pupils. It was located at Catmon Campus, Valenzuela St, Bulihan Malolos City, Bulacan. The Architect is Leonides Manahan and still in good condition up to the last survey in 2023 (**Figure 6** and **Table 1**).

Figure 6.
La Consolacion University Philippines-Catmon campus Mo. Rita and Mo. Concuelo buildings.

	Facilities	***Descriptions***
A.	Classroom	
	• Number of Classrooms	26
	• Classroom Size	7.20×9 meters = 64.8 sq.m.
	• Average Seating Capacity	50 seats
B.	Drafting Room	
	• Number of Room	1
	• Classroom Size	7.20×9 meters = 64.8 sq. m.
C.	Computer Center	
	• Number of Computer Center	1
	• Size/floor area	7.20×9 meters = 64.8 sq. m.
	• Seating Capacity	30 seats

	Facilities	***Descriptions***
D.	Speech Laboratory	
	• Number of Speech Lab	1
	• Size/floor area	7.20×9 meters = 64.8 sq.m.
	• Seating Capacity	50
E.	H. E. Room	
	• Number of H.E. Room	1
	• Size	64.8 sq. m.
	• Seating Capacity	50 seats
F.	Audio-Visual Room	
	• Number of AVR	1
	• Size/floor area	192 sq. m.
	• Seating Capacity	164 seats
G.	Library	
	• Number of Library	1
	• Size/floor area	322 sq. m.
	• Seating capacity	120 seating capacity
H.	Science Laboratory	
	• Number of Laboratory	1
	• Size/floor area	194.4 sq. m.
	• Seating Capacity	50 seats
I.	Reading Room/Lab.	
	• Size/floor area	41.25 sq.m.
J.	Reading Room 2	
	• Size/floor area	33.75 sq.m.
K.	Guidance Office	
L.	Accreditation Room	
	• Size/floor area	41.25 sq.m.
M.	Comfort Rooms	
	• Number of Comfort Rooms	12 (6 for Boys and 6 for Girls)
	• Size/ floor area	230.4 sq. m.
	• Number of Toilet Seat for Girls	20
	• Number of Toilet Seats for Boys	13
	• Number of Urinals	4
	• Number of Lavatories	14
N.	Hallway, Stairs, and Storage	
	• Total floor area	1,412.84 sq. m.
O.	Micro Teaching Laboratory	
	• Total Floor Area	152.1 sq.m.
	• BCM Office	9 sq. m.

	Facilities	*Descriptions*
	• Demo Room	64.8. sq. m.
	• Exhibit room	55.8. sq. m.
P.	Offices	
	• Principal	15. sq.m
	• Subject Area Coordinator	63 sq.m.
	• Discipline	16. sq.m.
	• Faculty Room	126. sq.m.
	• Student Activities	16 sq.m.
	• ISO	16. sq.m.
	• NSTP	16. sq.m
	• IEP	30 sq.m.

Table 1.
Inventory of basic education building facilities (Mo. Consuelo and Mo. Rita Building) *(total floor area = 5034.84 sq. m) [8].*

3.5 Historical survey of the identified modern heritage structure, the Mother Rita and Mother Consuelo building

La Consolacion University Philippines is formerly the University of Regina Carmeli which was established in 1937 with its first campus located right beside the historical Barasoain Church. As the student population grew bigger and programs being offered are getting more, the Augustinian Sisters as the owner of the Institution decided to purchase a piece of land. In 1981, new campus at Capitol View Park Subdivision in Bulihan, Malolos, Bulacan with an area of 5 hectares became the house the two identical parallel buildings namely Mother Rita and Mother Barcelo. Mother Rita and Mother Barcelo are the foundresses of the Augustinian Sisters of Our Lady of Consolation in the Philippines. As the population in the said campus increased, new buildings were added. The Mother Rita and Mother Barcelo as two identical two-storey buildings were joined together. The building used to be square in plan with courtyard at the center (**Table 2**).

3.6 Mother Rita and Mother Consuelo buildings are assessed based on their structure and physical condition

The **Table 3** shows the La Consolacion University Philippines Catmon and Barasoain Campuses assessment result base on its existing building conditions and available buildable space for future and need development.

3.7 Survey of the construction of the building of Mother Rita and Mother Consuelo

The oldest structure in the Catmon Campus of La Consolacion University Philippines is the Mother Rita and Mother Conseulo Buildings that was established in 1981. The Mother Rita and Mother Consuelo are the very first structures constructed in the

	Facilities	***Descriptions***
A.	Dean's Office	
	• Floor Area	31 sq.m.
B.	Classroom	
	• Number of Classrooms	5
	• Size of Classroom	7.20×9 m = 64.8 sq. m.
	• Average Seating Capacity	50 seats
C.	Nursing Laboratory 1	
	• Floor area	131.4 sq.m.
	• Number of Amphitheater	1
	• Seating Capacity	50 seats
D.	Nursing Laboratory 2	
	• Floor area	194.4 sq.m.
	• Number of Amphitheater	2
	• Seating Capacity	100 seats
E.	Anatomy Laboratory	
	• Size of Classroom	7.20×9 m = 64.8 sq. m.
	• Average Seating Capacity	50 seats
F.	Comfort Room	
	• Number of Comfort Rooms	4 (2 for Boys and 2 for Girls)
	• Size/floor area	70 sq. m.
	• Number of Toilet Seat for Girls	8
	• Number of Toilet Seats for Boys	6
	• Number of Urinals	2
F.	Hallways and Stairs	
	• Total floor area	3612 sq. m.
G.	X-Ray Room	
	• Laboratory	139.5 sq. m.
H.	MED Tech Laboratory	
	• Total floor area	63 sq.m.

Table 2.
Inventory of nursing facilities (incorporated in basic education building: Mo. Consuelo and Mo. Rita Building/ total floor area of 945.2 sq. m) [8].

CAMPUS	Location Catmon Campus	EXISTING BUILDING			PHYSICAL STATUS	BUILDABLE SPACE for new classrooms		REMARKS
		School Bldg.	Type of Bldg.	No. of Classrooms		Yes	No	
La Consolacion University Philippines Catmon Campus	Mo. Rita and Mo. Consuelo Bldg.	Basic Education	2-Storey Concrete	32	Good Condition	/		Catmon Campus has a total Land Area of 52,802 sq.m with a Building Foot Print of 22,095.54 sq.m. with remaining buildable space of 82.08%
	Sto. Nino Bldg.	College/ Basic Ed.	2-Storey Concrete	9	Newly Constructed	/		
	St. Augustine Building	College	5-Storey Concrete	9	Good Condition	/		
	Our lady of Good Counsel Bldg.	College	1-Storey Concrete	1	Good Condition	/		
	Our Lady of Consolation Bldg.	College	-Storey Concrete/ Wood	1	Good Condition	/		
	Mo. Consuelo Bldg.	Alternative Education	2-Storey Concrete	3	Good Condition	/		
La Consolacion University Philippines Barasoain Campus	St. Joseph Bulding	College	2-Storey Concrete	1	Newly Renovated	/		Barasoain Campus has a total land area of 2,526 sq.m. with a bldg. footprint of 4,225 sq.m. with open space of 17.35%
	Mt. Carmel Bldg.	College	2-Storey Concrete	7	Good Condition	/		
	Sacred Heart Bldg.	College	2-Storey Concrete	3	Good Condition	/		

Result shows that Mother Consuelo and Mother Rita Buildings are still in good condition, sturdy and safe for occupancy as the administration of La Consolacion University Philippines has an established and good practice of preventive maintenance.

Table 3.
Existing building conditions and available buildable space [8].

campus, both are identical structure made up of massive concrete, since the structures were designed by local Architect Leonides Manahan, it has the distinct Brutalist architectural character of massive concrete façade with concrete parapet. Despite being the oldest building, it maintains it condition being safe and structurally sound proof.

3.8 Survey of the defects of the building of Mother Rita and Mother Consuelo

The ocular visit and actual site investigation of the Mother Rita and Mother Consuelo Buildings show no indication of form of structural defects. The documents of preventive maintenance of the university also shows that they were periodically and consistently conducting the preventive maintenance. The fire certificate and other necessary permits being renewed annually are all secured proving that the oldest buildings in the campus are in really good condition.

3.8.1 Mechanical properties

- *Concrete*- shrinkage and creep, tensile strength, flexural strength, compressive strength, and elastic modulus.
- *Steel*- hardness, toughness, tensile strength, yield strength, elongation, fatigue strength, corrosion, plasticity, malleability and creep.

3.8.2 Strengthening measures

- *Concrete*- Concrete's compressive strength in pounds per square inch (psi).
- *Steel*- The usual units used to measure tensile strength are Pascal (Pa) or pounds per square inch (PSI).

3.8.3 Repair and strengthening

1. Structural Elements are intact:
    - Beam
    - Slab
    - Slab Canopy
    - Roof Beam
2. Minimal deterioration of materials
    - Due to age
    - Due to wear and tear to weather
3. There is periodic preventive maintenance
    - in the beams
    - in the slab

- in the slab canopy
- in the roof beams

3.9 Improvement of safety against earthquake

For the past 10 years, the Mother Rita and Mother Barcelo buildings has been tested by several strong earthquakes, typhoons, and flooding. The Mother Rita and Mother Barcelo Buildings remain its original plan and structural components since it was constructed almost 42 years ago. Very minimal interior modifications have been made, like the alteration of movable wall timber partition. The building maintains its structural stability and show no sign of any major damage. Due to the periodic conduct of preventive maintenance, any potential cause of structural damages is being prevented.

The university has its in-house civil engineer and Architect, there is also the risk management team and consultants to ensure that everything is in place and in accordance with the safety standards. Twice a year, the university also administer the annual visual inspection of the structural components of the building. Building Official are also invited as well as the Fire Department to secure necessary permit in compliance with the requirements of the City Engineering Office.

4. Bulacan State University

The Bulacan State University Main Campus, encompassing 7 hectares, currently accommodates 13 colleges, each specializing in various fields. Despite this, the 63 courses are confined to just 10 academic buildings.

The planned extension site, which covers 25 hectares—more than double the size of the Main Campus—promises to address the issues present at the current campus. This expansion will enhance functionality, making the campus eco-friendly and user-oriented, and will refresh the university's image for students.

A thorough understanding of the current space utilization and zoning will facilitate improved planning for the extension. This approach will allow designers to identify necessary enhancements and integrate green design principles into the new campus layout, creating an innovative learning environment for students (**Figures 7–9**).

4.1 Federizo hall as identified modern heritage structure

Federizo Hall is the oldest building in Bulacan State University, Main Campus located at Guinhawa, Malolos City, Bulacan (**Figure 10**, **Table 4**).

4.2 Historical survey of Bulacan State University Campus

Bulacan State University, located in Central Luzon, is a 115-year-old state-run institution. Originally starting as a secondary school, it has grown into one of Region III's largest educational establishments, now serving over 35,000 students and employing 1500 staff members. The Main Campus spans 7 hectares and hosts 15 colleges. The oldest building on campus is Federizo Hall, which was constructed in 1970. Each college offers various fields of specialization, and there are a total of 63 courses spread across just 10 academic buildings.

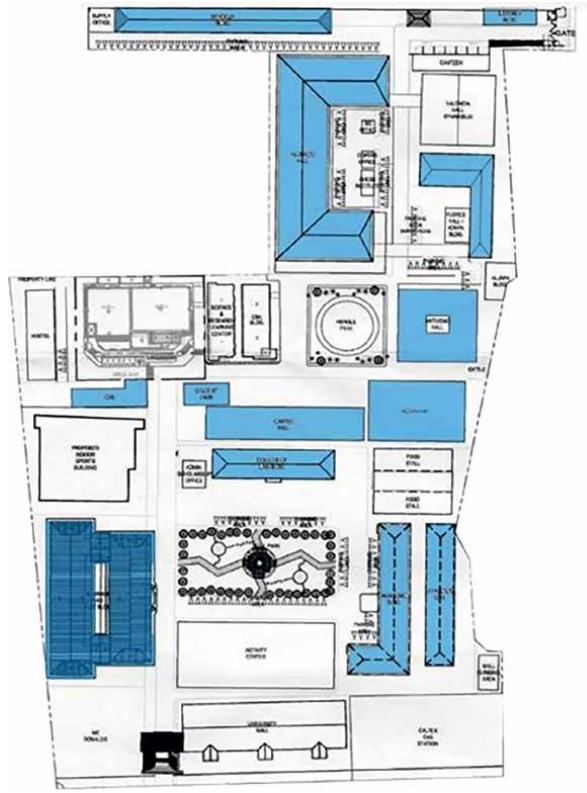

Figure 7.
Bulacan State University main. Campus physical development pPlan.

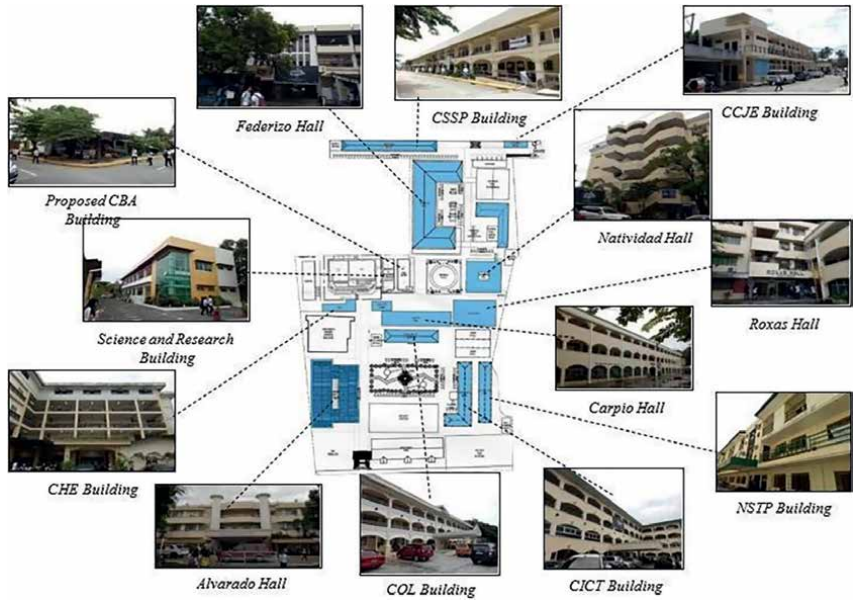

Figure 8.
BulSU campus physical development plan with its buildings.

Figure 9.
BulSU campus physical development plan with its buildings.

Figure 10.
BulSU Ferderizo Hall (3-Storey Building made up of concrete and steel material).

A recent survey revealed that many students find the Main Campus to be overcrowded and inadequate for their academic needs, with walkways lacking coverage, which exacerbates the heat and makes movement between buildings uncomfortable. Furthermore, there are limited recreational areas for students, such as shaded parks.

Federizo Hall	**Colleges**	**Building Characteristic**
	Graduate School College of Science College of Arts and Letters College of Architecture and Fine Arts	Federizo Hall is the oldest building in the Campus. Some part of the building is already deteriorated and there are broken windows present on each floor. The building holds 4 colleges that becomes one of the buildings that have a high population. Even though it was old, the environment of the building was full of trees and vegetation that helps to block the heat from the sun and makes the Indoor environment cool. On the lower floor of the building, the rooms use artificial lighting and cooling systems. This was because of the need of the activities they perform and also because the day light cannot penetrate inside the classrooms due to the high trees, in contrary, good in making indoor air quality. While on the upper level, most rooms use natural day light and ventilation. Taking advantage on building height that captures the light and wind that can be use as an alternative source.
Building Specifications	Description	
Building Footprint	99×54 m	
No. of Floors	3-Storey	
No. of Rooms	46	
No. of Students	5191	
Architectural Features	Advantage / Disadvantage	
	Building Plan – The linear plan of the building helps to distribute the heat from the classrooms with out trapping it into certain parts of the building	

Table 4.
Federizo Hall physical description and current use [8].

The planned development of an extension site, which will cover 25 hectares—more than twice the size of the Main Campus—is expected to address these issues. This expansion will alleviate overcrowding, enhance comfort, and introduce more eco-friendly and user-friendly features. Additionally, it will revitalize the university's image for students.

4.3 Buildings are assessed based on their effectiveness

A criteria matrix was developed to identify the key components needed for the building, based on an evaluation of the existing structures' conditions. Consequently, the buildings on the extension site will require renovation. Important factors to consider include functionality, security, reliability, accessibility, fire safety, and green design features, each assigned a different weight according to its significance. This matrix will guide the planning for the new facilities at the extension site. Therefore, the laboratory high school building, which was identified as necessary, will continue to be part of the extension development.

4.4 Any buildings that fall under 50% will be considered to be redeveloped on the extension site

1 – Poor Condition, 2 – Below Average, 3 – Average, 4 – Above Average, 5 – Excellent
S – Small Population, A – Average Population, L – Large Population.

List of Buildings	Population Density	Architectural Elements	Functional Design	Safety and Security	Durability and Maintenance	Accessibility	Fire Safety	Green Design	Total	Remarks
		5%	10%	15%	20%	15%	15%	20%	100%	
Flores Hall	L	1	3	3	4	2	2	1	48%	Needs Development
Alvarado Hall	A	4	4	3	3	3	3	1	55%	Good Condition
Law Bldg.	S	2	3	3	4	4	3	1	58%	Good Condition
CICT Bldg.	L	2	3	2	4	3	2	1	49%	Needs Development
CHE Bldg.	A	2	3	3	4	3	2	1	50%	Good Condition
Science Bldg.	S	2	3	3	5	4	4	1	65%	Good Condition
Carpio Hall	A	1	2	2	2	3	3	1	41%	Good Condition
Roxas Hall	L	1	2	1	3	1	1	1	30%	Needs Development
Natividad Hall	L	2	3	1	3	1	1	1	31%	Needs Development
NSTP Bldg.	A	1	2	2	3	3	3	1	45%	Needs Development
Federizo Hall	L	2	2	2	1	2	2	1	32%	Needs Development
CSSP Bldg.	A	3	3	3	4	3	3	1	56%	Good Condition
CCJE Bldg.	S	1	4	3	4	4	3	1	59%	Good Condition

Table 5.
Bulacan State University list of buildings and its condition [8].

The **Table 5** illustrates that the primary factors in selecting a facility are the building's maintenance needs, durability, and environmental sustainability. Durability is particularly crucial, as it underpins all other considerations; a facility that lacks durability poses increased risks to students and staff. Additionally, the application of green building standards is a key aspect of the Extension Site's development. Consequently, none of the reviewed buildings excel in green design.

4.5 Survey of the construction of the Federizo Hall determined as a modern heritage building

The campus's oldest building, Federizo Hall, was erected in the 1970s. It is a three-story concrete structure, extending from the first to the third floor. The roof is covered with a concrete parapet, supported by timber trusses, and topped with corrugated galvanized iron sheets.

4.6 Survey of the defects of the Federizo Hall

Cracks, water seepage, concrete spalling, and rusted reinforcing bars can lead to severe damage if not addressed. To extend the lifespan of any building, it is essential to evaluate these defects and apply the appropriate repairs and retrofitting techniques. Neglecting such issues can result in financial costs, create unsafe conditions for work and learning, and, in the worst case, cause physical harm to those involved with the facility.

Federizo Hall houses students from the Graduate School, College of Science, College of Arts and Letters, and College of Architecture and Fine Arts. This study aimed to evaluate Federizo Hall on the Main Campus to provide the university administration with recommendations for funding and retrofitting the building, enhancing its preparedness for emergencies (**Figures 11** and **12**).

4.6.1 Mechanical properties

- *Concrete*- shrinkage and creep, tensile strength, flexural strength, compressive strength, and elastic modulus.
- *Steel*- hardness, toughness, tensile strength, yield strength, elongation, fatigue strength, corrosion, plasticity, malleability and creep.

4.6.2 Strengthening measures

- *Concrete*- Concrete's compressive strength in pounds per square inch (psi).
- *Steel*- The usual units used to measure tensile strength are Pascal (Pa) or pounds per square inch (PSI).

5. Repair and strengthening

5.1 Structural elements to be restored, repaired & rehabilitated

- Beam
- Slab
- Slab Canopy
- Roof Beam

5.2 Cause of deterioration of materials

- Due to age
- Due to wear and tear to weather
- Due to lack of periodic maintenance

Figure 11.
Federizo Hall–third floor ceiling with visible severe damaged due to age.

Figure 12.
Federizo Hall–third floor slab with visible cracks.

5.2.1 Appropriate solutions to be considered

- Rust converter and epoxy plastering applied in beams
- Rust converter and epoxy plastering in the slab
- Rust converter and epoxy plastering in the slab canopy
- Applying rust converter and epoxy plastering to roof beams

5.3 Improvement of safety against earthquake in Federizo Hall

Over the years, the university's older buildings, including Federizo Hall, have experienced varying levels of earthquake intensity, from low to severe. By the time of

the 1990 earthquake, the building was already old enough that the original designers and contractors were no longer responsible for its condition. Following this event, building officials and the Department of Public Works and Highways were requested by professionals to conduct a visual inspection. The most significant damage identified was limited to cracks in Federizo Hall's roof slab and exposed reinforcing bars due to concrete spalling, with no additional structural damage reported.

The most recent earthquake occurred in April 2019. During this event, university professionals, along with Department of Defense engineers and staff from the Department of Public Works and Highways and City Engineering, performed a visual inspection. This examination revealed only minor concrete flaking, hairline cracks, and exposed reinforcing steel bars. No further testing, either destructive or nondestructive, has been documented for these buildings.

- Due to its age and inadequate maintenance, some of Federizo Hall's structural components are already showing signs of damage. Although most of the structure is in good condition, certain areas are problematic. Regular visual inspections and tapping surveys are necessary to monitor the building's condition and promptly identify which sections need repair.

- Employing nondestructive testing methods, such as the hammer rebound test, provides immediate results without causing additional damage to the structure and is therefore recommended. To avoid further deterioration, it is also advisable to conduct regular structural audits or perform them as needed.

- Implementing a structural audit management plan is crucial, as it supports the development of a preventive maintenance program that can extend the building's lifespan.

6. Conclusion

In order to foster resilience and create a better future, this study examines how the administration of Bulacan Universities both public and private with identified modern heritage buildings might help safeguard cultural heritage in zones by addressing values associated with the built environment. As this study revealed; one Private University in Bulacan has recorded one Modern Heritage Building built in 1986 with a known local Architect while the State University in Bulacan had one identified building classified as modern heritage that was constructed in 1971 but with an unknown designer. Based on the findings, from 1971 to 1986 as the two modern heritage buildings were determined, University Buildings that are modern heritage were made of concrete and steel materials on these years, with concrete parapets concealing the roofs and massive concrete designs protecting the windows against the sun in the exterior of the second floor or serving as concrete parapet along the corridor railing. The vast concrete constructions that make up modern heritage buildings are constructed.

At present, there is a lack of proper documentation, protection and proper identification of the modern heritage buildings in Bulacan Universities. Many modern heritage buildings are frequently abandoned after 40 to 50 years of age due to a lack of understanding, awareness, or appreciation of their significance and the inability to preserve them. The potential destruction of these priceless buildings portends a ruptured relationship with contemporary heritage.

According to the Getty Conservation Institute, the study titled "Conserving the Modern Architecture Movement" has highlighted several reasons why modern architecture is often neither preserved nor fully valued:

1. The absence of a consistent analytical approach.

2. A focus on replacement rather than repair.

3. Issues related to functionality, adaptation, and sustainability, as well as the challenge of the relatively short historical timeframe for assessing the Modern Movement, which impacts conservation efforts.

The success of protecting modern heritage is not dependent on the efforts of a single person, but rather on the collaborative synergy of many disciplines that must be in harmony.

It is hoped that as time progresses, both current and future generations will naturally develop a deeper appreciation for buildings that represent the diversity and richness of modern heritage. This growing respect will foster a sense of assurance that the university's buildings will be preserved and valued. To prevent the loss of other significant structures, it is crucial to raise public awareness, emphasize their importance amidst the remaining buildings, and educate community and academic stakeholders on preservation methods.

6.1 Recommendations

1. The Universities in Bulacan, both private and public should be engaged in the drive or action to protect the heritage structures within their campus. As a member of the Higher Education Institution, the administration should identify and document properly all the modern heritage structures that exist within their campus and properties. Such Identified modern heritage structures should be given appropriate protection through suitable intervention to whateverever identified as damaged or state of deterioration in any of its parts.

2. The university administrators must always consult and entrust the experts with all necessary work to be done in the structures determined as modern heritage. The existing heritage laws must always be considered. Planning must involve all individuals to actively participate in the formulation of concrete and long-range solutions for protection of the modern heritage structures.

3. A concrete management plan to maintain, protect, and preserve any structure as modern heritage can be developed. Comprehensive and sustainable short-range and long-range plans gearing toward the assurance of longer life expectancy of the structure/s relevant to the community serving its very purpose as memory of the past with relevance to the future.

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Chapter 2

Contribution of Geospatial Data in the Mapping and Restoration of Sacred Forest in the Grassfield Communities in Cameroon

Ndjounguep Juscar, Nnoko Harrison, Ayamba James and Mannual Prossie

Abstract

Throughout the centuries, the grassfields of Cameroon have been the site of the development of numerous social and cultural values associated with sacred forests. These values are deeply intertwined with the socio-cultural roles that local people have attributed to the forests, which serve as places of worship and ritual. Managed under chieftaincy, these sacred forests have historically safeguarded the villages from threats and adversities. Unfortunately, the biodiversity of these forests is now under threat due to agricultural activities, rapid population growth, and other land use issues. To address these challenges, a participatory demarcation and remote sensing approach can aid in understanding the issues affecting these sacred forests. Furthermore, implementing a restoration plan in collaboration with local communities, including the identification and preservation of local species, is crucial for the sustainable protection of these forests, ensuring the continuation of the cultural practices that are integral to these communities.

Keywords: sacred forest, participatory mapping, restoration, cultural values, land tenure

1. Introduction

The tree cover of the sacred forests of the western highlands is prey to human activities (agriculture, strong population growth, and climate change) and other land issues that contribute to their crumbling and denaturalization.

Over the centuries, many social and cultural values have been developed around sacred forests by local people. These values were linked to the socio-cultural roles assigned to them by the local people and helped to reinforce the mechanisms set up locally to protect these forests. These measures included the prohibitions that ensured respect for this circumscribed area and the regular worship services held in

the villages during periods of crisis. Under the coordination of the chiefdom, divine beliefs contributed enormously to the protection of the village against its enemies and various calamities.

These sacred forests, which were an important reservoir of biodiversity in the villages/kingdoms, were not to be neglected as they enabled sustainable conservation by leaving natural forest formations.

The participation of local people [1, 2] in development initiatives affecting them has been interpreted in different ways in practice. 'It is a constantly reactivated, functional, and pragmatic dynamic, in which development agents and local people combine their knowledge, know-how and will in concerted partnership actions to improve, in a sustainable way, the assumption and management of the actions undertaken'. This concept allows the technician involved in the participation process to maintain the predominant place and role of the local people in achieving their aspirations. It is then up to the people to take responsibility for designing and carrying out their undertakings [3].

The participation of communities in their own development is not new. Tchawa and Moupou [4, 5] quoted by Ndjounguep [6, 7] speaking of the genesis of the participatory approach in Africa and Cameroon, show how socio-economic conditions and the needs for sustainable development require the participation of all stakeholders. Participation varies in intensity, from forms with a low level of participation to forms characterized by a real transfer of power to individuals and populations. In this work, participation is a community diagnosis tool that requires an appropriate method and consistent results to ensure that local or collective data is taken into account in the decision-making process [6].

According to Amelot et al. [8], quoted by Ndjounguep [6, 7] participatory mapping is about consultation and information. It is propaganda mapping insofar as the basic geographical data have often been manipulated, hence the need for stakeholders to criticize and use them.

Participatory mapping for sacred forests in highland villages in the West Cameroon region aims to (i) restore the link between communities and these cultural spaces that are prey to accelerated degradation and (ii) restore cultural and economic values to strengthen biodiversity conservation and land tenure security [9].

2. Materials and method

2.1 Presentation of the study area

The kingdoms of Bameka and Bamougoum are situated in the departments of Haut-plateaux and Mifi, respectively. They are positioned between latitude 5°25′50" North and longitude 10°20′16″. These kingdoms fall under the first-degree chieftaincies of the West region, holding vast territories overseen by the king, 3rd-degree chiefs, and notables, with a population of over 21,392 inhabitants (as per Bucrep [10]) [11]. The Mifi River is the primary watercourse running through these areas. Please refer to **Figure 1** for the precise location of the study area.

2.2 Methodology

The sustainable restoration of sacred forests in the highlands of the West region was facilitated through participatory mapping using the unified methodology for participatory mapping in Cameroon [12, 13] (2016). This collaborative process

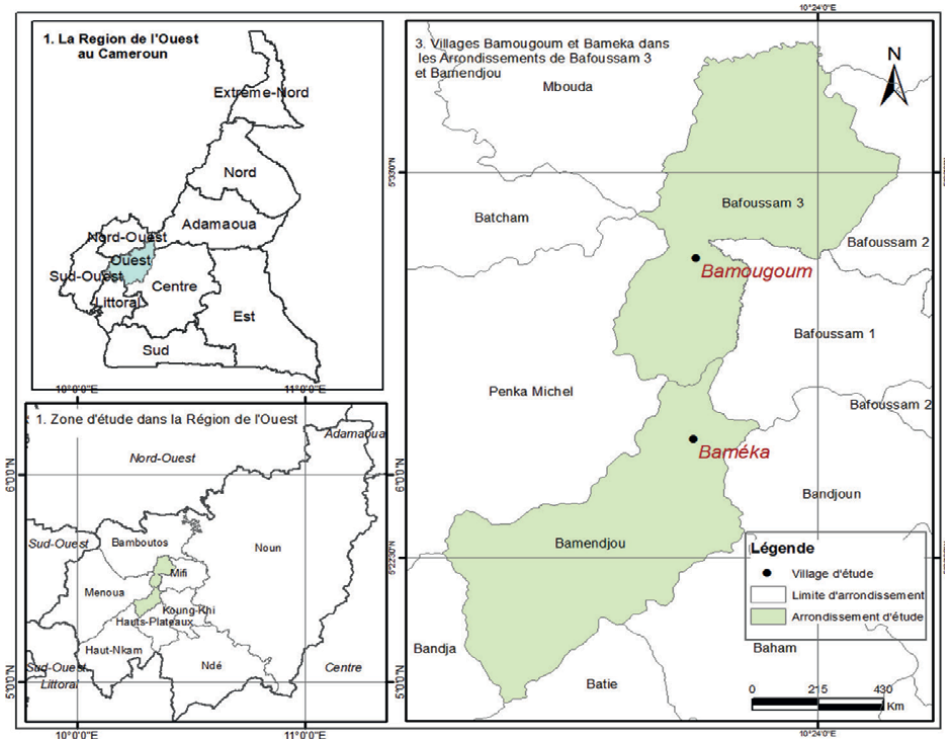


Figure 1.
Location of the study area.

engaged stakeholders in identifying and locating sacred forests and sites, outlining their boundaries, highlighting existing challenges, creating and validating maps of the area, and exploring options for restoration. Through participatory demarcation, stakeholders were able to gain insights into their roles and the challenges impacting the sacred forests, thus enabling them to pinpoint necessary actions for conservation improvement. An illustrative stakeholder information meeting is depicted in **Figure 2**.

2.3 Sensitization

Raising awareness is a crucial step in the participatory mapping process, as it helps identify stakeholders and invite them to participate in various activities. When it comes to sacred forests, only those who are affected by their sacred nature take part, such as the King, village chiefs, notables, and traditional practitioners. We organized focus groups to better involve the stakeholders in the process and emphasize the participatory aspect of the activities. This phase helped clarify the planned activities, obtain Free Prior Informed Consent (FPIC) for effective participation, gather relevant information on sacred forest management, and identify the species to be planted to enhance sacred forest conservation (**Figure 2**).

2.4 Carry out participatory mapping

The initial implementation of participatory map is awareness-raising meeting. It was efficiently created with stakeholders appointed by the Paramount Chiefs

Figure 2.
Information meeting with chiefdoms. Photo Ndjounguep, 08, 2022.

(including Notables, Prime Ministers, Chief's representatives, sacred forest managers, and women's spokespersons). This pivotal stage offered an initial understanding of the spatial distribution of the sacred forests and degraded areas, as well as the individuals contributing to degradation. Creating the mental map involved:

- Defining thematic layers such as uses of the sacred forest (medicinal plants, NTFPs, fishing, hunting, gathering: raffias, and stems)
- Establishing the legend and symbology
- Drawing the mental map on the ground
- Representing primary boundaries and physical geographic features
- Depicting communication routes (roads, tracks)
- Mapping watercourses
- Depicting socio-collective facilities (chiefdoms, households, etc.)
- Representing thematic classes
- Defining routes for data collection
- Identifying areas of sacred forest degradation
- Determining restoration needs including species and areas.

All this data was gathered in the field using a GPS gaming system, with the participants, who were authorized for sacred forest and site management, leading the facilitation. The collected data was utilized to create a digital map (**Figure 3**).

2.5 Digital mapping elaboration process

Digital mapping is the phase of the process that encompasses data collection and the subsequent sharing of information with the community. Due to the participatory

Figure 3.
Training of notables on the use of GPS for data collection on sacred side, Bamengoum village. Photo Ndjounguep, 08, 2022.

nature of the project and the need for confidentiality surrounding the sacred forests, the data was obtained by knowledgeable and willing community members who were carefully chosen and trained in the use of GPS technology for spatial data collection. The collected data was then analyzed by the GIS manager, leading to the creation of various thematic maps (**Figure 4**).

2.6 Result restitution and map validation

The completion of the process involved two phases: a data verification phase to generate the maps, and a final validation and feedback phase.

Figure 4.
Field data collection phase. Photo Ndjounguep, 08, 2022.

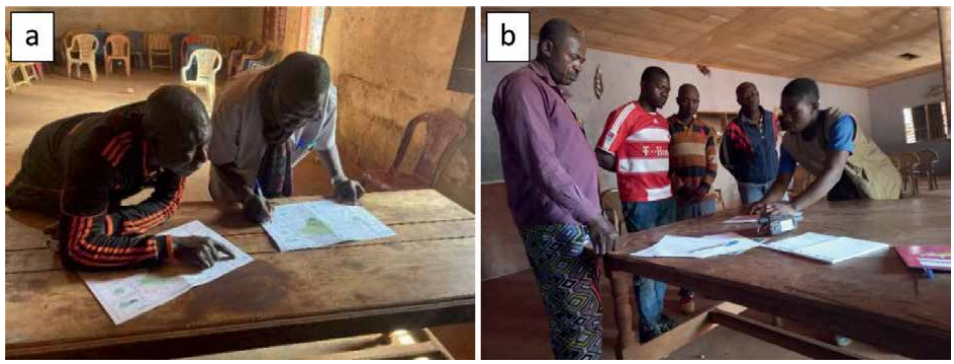


Figure 5.
Map validation with notables. Photo Ndjounguep, 08, 2022.

The map-checking phase aimed to rectify any errors in toponymy and form, with the participation of the community's notables who had been involved in the awareness-raising, training, and data-collection meetings. This phase ensured that any mistakes in the spelling of the names of sacred sites were corrected.

Following the verification phase, the cartographic data was returned to the community for review. At this stage, the individuals involved in data collection presented the final maps to the population for validation, and each notable and various kings received a copy of the map (**Figure 5**).

3. Results

3.1 Types of sacred forest in the Cameroon western highland

In the highlands of West Cameroon, there are three distinct types of sacred sites: sacred forests, neighborhood sacred forests, and sacred sites. These sites are considered to house the gods that protect the village during times of crisis and are highly revered by the local people. However, the perception of these sacred forests has been negatively impacted by the forces of globalization, leading to a reduction in their cultural value and a lack of respect for their sacredness. As a result, these sites are facing increasing human pressure for agricultural land, firewood, and housing. To address this issue, it is imperative to identify and implement effective practices for the cultural and economic management of sacred forests. Doing so could not only help conserve biodiversity but also preserve the cultural values of the populations in the highlands of West Cameroon (**Figure 6**).

3.2 The importance of sacred forests in the highlands of Western Cameroon

The significance of sacred forests is deeply intertwined with the cultural and social roles assigned to them by local communities. For generations, these forests have been safeguarded by local customs, serving as venues for traditional courts, spiritual practices, and as sources of botanical materials for artisans and traditional healers.

Local beliefs attribute divine qualities to these forests, as they are believed to be inhabited by the spirits and deities of the village's ancestors. These divine entities are thought to shield the community from adversaries and misfortunes. The forest gods are revered in times of crisis and also in the everyday lives of the villagers, playing a crucial role in various aspects of their spiritual and practical existence.

Figure 6.
Idendified sacret side (Bamougoum market (a) water source (b) and the sacred huts (c)). Photo Ndjounguep, 08, 2022.

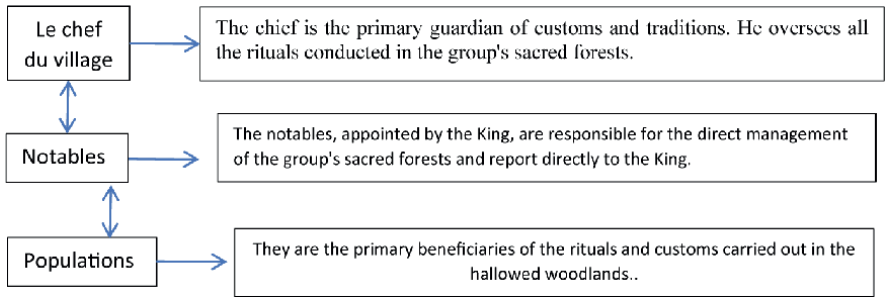
A profound spiritual connection exists between the people and the resources found within the sacred forests, shaping a unique alliance. Customary regulations dictate the utilization of these forests, encompassing strict guidelines and prohibitions. Only those who have been initiated are permitted to access specific areas, and a range of activities such as hunting, tree felling, and farming are strictly prohibited.

The sacred forests within the region consist of both eucalyptus trees and natural vegetation. The eucalyptus trees dominate vast areas of the sacred forests, lending a distinct character to these revered landscapes.

3.3 Sacred forest management methods

The most important are those around the chiefdom.

The others, made up of small patches of forest, are located in strategic areas of the group.



Sacred forests are managed in a special way. Harvesting is allowed to a certain extent. Firewood, dead wood, medicinal plants and bark, fruit and condiments, honey and small game may be harvested, but the harvested items cannot be sold. These forests are protected by a set of rules—no crops can be grown in them, only the edges are allowed to be used for cultivation. To harvest from the forest, offerings such as salt and palm oil must be made first. Penalties for breaking these rules are imposed by the tutelary deities.

Unfortunately, these sacred forests are shrinking due to the increasing pressure on the land they occupy. Every year, agricultural activities encroach more and more on the woodland. Another threat is religious conversion, as people who convert to other religions no longer honor the prohibitions. Surprisingly, the sacred forests are better preserved compared to the forest reserves created by the State [14].

3.4 History of the villages and link with the sacred forests

The oral history of the Bameka people, also known as 'Muka' in the local language 'Ngembà', indicates that the first chief of the Bameka kingdom came from a family of hunters. Around 1700, four hunting brothers from Fongo Tongo in what is now the Menoua department discovered unoccupied land and decided to settle there. Their names were SAA, NKA, NgOUM, and NDJOU. SAA chose to stay where he was, while NKA settled on the other side. It was from his name that the name Bameka originated. Since its establishment in 1700, the Bameka kingdom has seen 20 kings succeed each other as the leaders of this chiefdom.

The Bamougoum kingdom, known as Ngwong Mungoum in the Ngemba language, was founded in 1403 by Ndjwongveu, who also became its first king.

The sacred forests have existed since the village's creation and have been maintained over the generations. The king acts as the guardian of tradition and is solely responsible for all the sacred forests. Historically, the sacred forests have facilitated the formation of spiritual and traditional relationships between past and present generations. The king is supported by the prime minister of the group and other notable individuals.

3.5 Physical environment characteristics

The area receives high rainfall, ranging from 1500 to 2500 mm per year, with an 8-month rainy season and a 4-month dry season [15]. The population density ranges from 90 to 300 inhabitants per square kilometer [16, 17]. There is significant demographic pressure, and the population tends to be older [15]. The North-West region accounts for 25.2% of the country's farms [16, 17], and the area is heavily farmed.

It is situated in a densely forested ecosystem, but deforestation caused by human activity has led to the degradation of farmland and timber resources [16, 17]. The forest presence has decreased, and wooded savannah has developed due to deforestation [18]. Since the 1990s, 90% of the forest reserves have been occupied, and the relict forests of the highlands have disappeared. The vegetation on the plateau has been significantly affected by human activity.

The sacred forests still contain a variety of forest species, and the hedgerows and concessions have been enriched with fruit trees [16, 17]. These areas have both ritual and political significance.

Our field observations have shown that the vegetation predominantly consists of grassy savannah with tall grasses such as sunflowers and sissongos. Additionally, there are fruit trees, eucalyptus, raphia, and Chinese bamboo in marshy areas (**Figure 7**).

3.6 Participatory maps elaboration of sacred forest

The participative mapping operations helped locate and mark 14 sacred forests in two villages: 5 in Bameka and 9 in Bamougoum. 70% of these areas are part of the chiefdom's sacred forests, while the remaining 30% are sacred sites and other small sacred forests in the crossroads or neighborhoods. In total, 237.31 hectares were identified as belonging to the sacred forest domain for the two groups, with 61% for Bamougoum and 49% for Bameka. **Figure 8** displays the spatial distribution of the identified sacred forests.

Figure 7.
Vegetation around sacred forests. Photo Ndjounguep, 08, 2022.

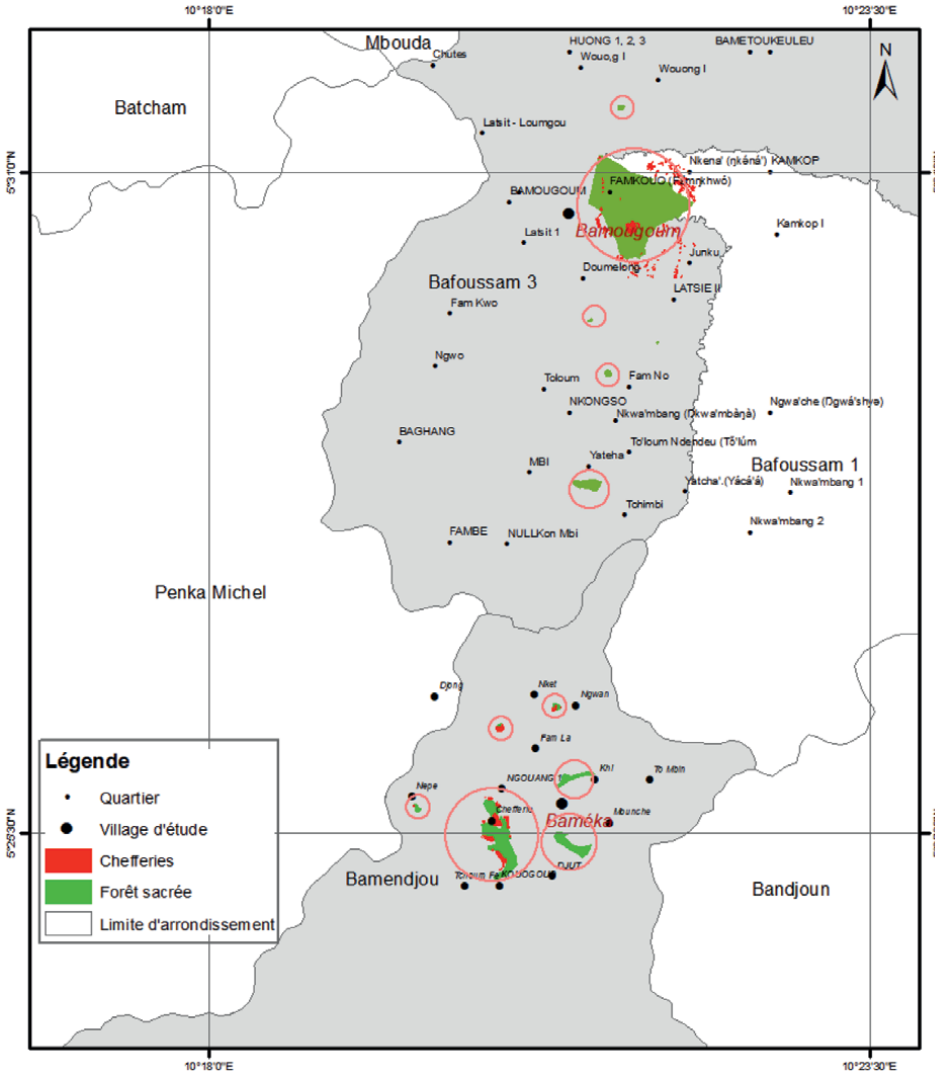


Figure 8.
Participatory map of sacred forests in Bameka and Bamougoum.

3.7 Land cover dynamic in the sacred forest

An analysis of satellite imagery from the Sentinel 2 sensor for the years 2012 and 2022, along with field data, reveals that the land use around the sacred forests has changed, affecting their integrity. Some areas have been reforested with Eucalyptus trees, helping to maintain forest cover, but not at its natural level. Overall, agricultural activities pose a threat to the sacred forests, contributing to their gradual decline. The sacred forest around the chiefdom is managed by the royal family, with each woman holding a portion that she cultivates to support her family. Please refer to **Table 1** for the changes in land use around the sacred forests between 2012 and 2022.

The sacred forests have been impacted by construction, the creation of fields, and the planting of eucalyptus trees. These activities have altered the original landscape, leading

Occupation du sol	2012	2022	2012%	2022%	Differences
Constructions	1.05	3.15	0.44	1.33	0.88
Champ	84.56	145.8	35.63	61.44	25.81
Savane	5.1	12.25	2.15	5.16	3.01
Forêt galerie	136	39.99	57.31	16.85	−40.46
Plantation eucalyptus	10.6	36.12	4.47	15.22	10.75
Total	**237.31**	**237.31**			

Source: Sentinel 2 Image, 2012 and 2022.

Table 1.
Occupation du sol dans les zones des forêts sacrées entre 2012 et 2022.

to the growth of savannah and gallery forests. Between 2012 and 2022, the percentage of land used for construction increased from 0.44% to 1.33%, fields expanded from 35.63% to 61.44%, savannah grew from 2.15% to 5.16%, gallery forests decreased from 57.31% to 16.85%, and eucalyptus plantations increased from 4.47% to 15.22%. **Figure 1** illustrates the changes in land use within sacred forests from 2012 to 2022 (see **Figure 9**).

There has been a 40.46% loss in gallery forests due to a significant increase in agricultural activities (25.81%), savannahs (3.01%), eucalyptus plantations (10.75%) and buildings (0.88%). The following figure depict rural activities in sacred forests (**Figure 10**).

Please remember the following information:

a. Eucalyptus is being harvested on the edge of a sacred forest in Bamougoum.

b. There is a field on the edge of a sacred site at the Bamougoum and Bameka market.

After establishing their fields, the farmers around the sacred sites and forests gradually encroach upon the forbidden zone by breaking up the forest. This encroachment often involves bush fires, cutting down nearby trees, and planting tubers or other plantain trees. These activities make the land look cultivated in the next growing season and lead to an expansion of the fields.

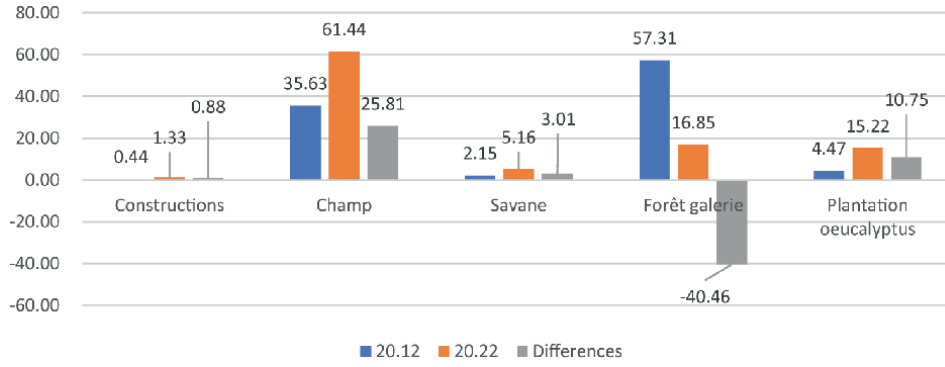


Figure 9.
Land use losses and gains source: Sentinel 2 Image, 2012 and 2022.

Figure 10.
Farming activities in the sacred forests. Photo Ndjounguep, 08, 2022.

This practice is becoming increasingly important due to the scarcity of land caused by the growing urban and rural population. In Bameka and Bamougou, the chiefs are compelled by this demographic boom to allocate areas around the sacred forest for cultivation to accommodate the people displaced from NOSO (nationals from the conflict zone in North-West and South-West Cameroon). In 2019, Chief Bamougoum offered them areas for the resettlement of those affected by the Ngouache disaster (a landslide in part of Bafoussam 3 in 2019) (**Figure 11**).

3.8 Local measures are taken to protect sacred forests from degradation

Chiefdoms put up fences made of shrubs and bamboo around the sacred forests to demarcate and protect them from degradation. These fences are important for conserving sacred forests against human degradation but are still vulnerable. In

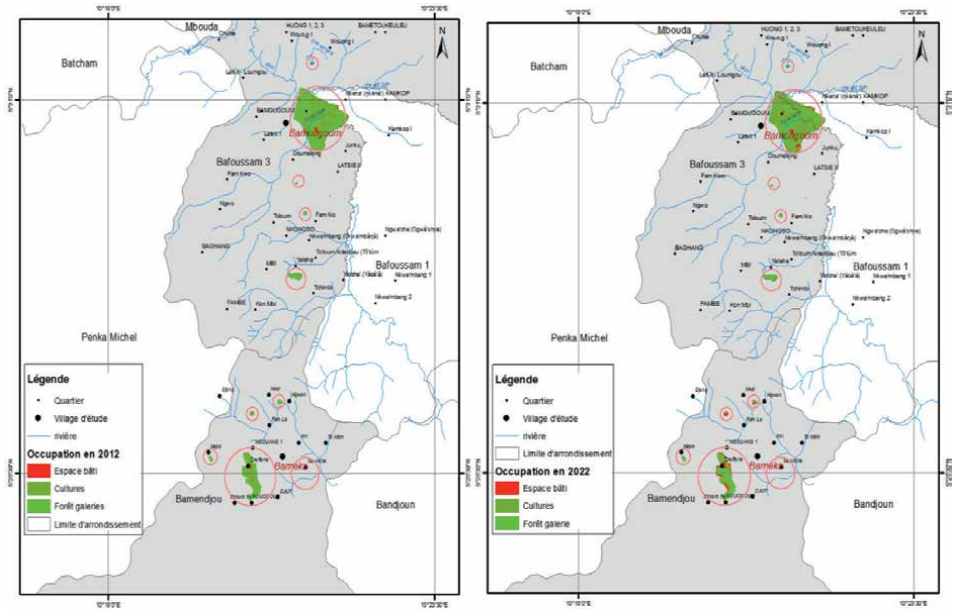


Figure 11.
Land use in the sacred forests in the localities of Bamougoum and Bameka.

Figure 12.
Protection of sacret site using bambou for fence building in Bamoungoum village. Photo Ndjounguep, 08, 2022.

response to the degradation of sacred forest areas, the chiefdoms and those in charge of the sacred forests also take endogenous protection measures. These measures include hedges around certain areas and planting eucalyptus trees at the boundaries. Bamboo fences are used to demarcate and protect against intrusion and degradation. These measures are of great importance for conserving sacred forests against human degradation (**Figure 12**).

3.9 Restoration needs of sacred forests

Restoration of degraded areas and promotion of the involvement of women and young people in reforestation activities will take place in the 25 hectares of sacred forests in the villages of Bameka and Bamougoum. This will involve:

- Reconstituting the boundaries of the sacred forests by using living hedges with specific plant species identified by the management team, such as neloum, eucalyptus, and bamboo.
- Restoring the buffer zones of watercourses and drinking water points using fodder plants and raffia palm.
- Rehabilitating degraded areas of the sacred forest by planting sacred and medicinal trees like Quinquina.
- Restoring fields and grazing areas around the sacred forests by planting fodder plants, fruit trees, and eucalyptus.

A table displaying the species chosen for the restoration of degraded areas within the sacred forests is provided below.

3.10 Identification of degraded patches for restoration in the sacred forest

The areas that need restoration were identified with the help of community leaders and confirmed on the day the participatory mapping data was collected, with input from the village chiefs. It was agreed with the village chiefs to restore the following areas:

- Sacred forests around the chiefdom
- Sacred forests in small neighborhoods
- Marshland/lowlands
- Fields around the chiefdom and around the sacred forests.

In total, the degraded areas of sacred forest make up about 14 hectares of the 30.15 hectares that were mapped. The specific species chosen for each area are listed in **Table 2**.

The species chosen for planting on degraded sites were based on the cultural specificities of the plants and their socio-economic contribution. The following **Figure 13** displays some of the degraded areas surrounding the sacred forests.

Type of plants	Area for restoration	Characteristics
Eucalyptus	Sacred forest at the bottom of the chiefdom	Lowlands, marshy areas and creek banks
Raphia	Along the river band	marshy areas and along streams and streams
Medeinal trees Quinquina	Au centre des forêts sacrées	Toutes les forêts sacrées des deux villages
Fruits trees	Farmland at the chief palace	The farmland located within the chiefdom's territory, near the forests and sacred sites.
Closing trees (neloum, eucaliptus, bambou)	Around sacred forest	All sacred sites
Identify plants suitable for animal nutrition through foraging.	Around Palace sacred forest	In the savannah areas, measures are in place to prevent the spread of cattle from the chiefdom domain into the forest zone.

Table 2.
Classification of species for reforestation in sacred forests.

Figure 13.
Agricultural activities around the sacred forests.

4. Discussion

In conclusion, it is crucial to preserve the sacred forests in the highlands of Western Cameroon [19]. Despite their size, these forests play a vital role in maintaining social harmony, cultural heritage, and biodiversity conservation. These areas, affected by human activities and climate change, have experienced a 40.46% loss of gallery forests due to a significant increase in agricultural activities (25.81%), savannahs (3.01%), eucalyptus plantations (10.75%), and construction (0.88%) for the Bameka and Bamougoum communities.

The losses highlight his urgency to preserve the sacred forests. Through a participatory mapping exercise in Bameka and Bamougoum, the condition and governance of 14 forests and sacred sites were assessed. Covering an area of 237.31 hectares, the significance of these sites lies in the ecosystem and socio-cultural/religious benefits they provide to communities. The sacred forests surrounding the chiefdom's land estate account for more than 70% of the land. These areas have varied forest stands with multiple uses [20]. The chosen restoration approach aims to preserve the existing stands without causing any disruption. Due to the limited availability of timber, it has become necessary to plant eucalyptus trees on the outskirts of the sacred forests to fulfill the wood needs of the local communities [21].

The participatory selection of restoration plan types in the highlands of Western Cameroon involves community participation in the sustainable management of sacred forests, although its use is conditional.

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Chapter 3

Developing a New, Effective Approach to Safeguarding Cultural Heritage Following the Normalization of Relations between Belgrade and Pristina

Vesela Radović

Abstract

We have seen firsthand how Kosovo and Metohija's cultural heritage has been deliberately targeted in the twenty-first century. The administration of the world heritage sites was significantly impacted by Kosovo's unilateral declaration of independence. Five cultural landmarks and locations from the Republic of Serbia are included as UNESCO World Heritage Sites. A set of sites in Kosovo is known as the Serbian Medieval sites are listed as endangered on the World Heritage List. The international community is aware of Serbia's challenges in effectively managing them. The author focuses on the continuous hazards that are brought about by indications that Kosovo and Serbia do not have a common heritage management policy. The recommendations that follow from the results serve as a starting point for more investigation. The principal suggestion is that Serbian authorities should collaborate with "Kosovo institutions" in the risk management process in its entirety, develop fresh ideas for heritage management, and set up a mutually agreeable legal framework. Normalization of relations in future could unlock many opportunities and one especially important for this article, region and word is preserving rich cultural heritage for future generations.

Keywords: world heritage site, cultural heritage, risk management, dialog, protection

1. Introduction

The acknowledged role of culture and the importance of cultural heritage for a sustainable future in the global community created assumptions that preserving culture is possible in conflict/wars. On the contrary, daily headlines, books, reports, news, and social media showed that cultural heritage challenges are daunting. Hence, the author addressed the destruction of cultural heritage in the wars happened in the twenty-first century despite existing normative-legal regulation from the global to the local level. In this chapter, having in mind that fact, there is a need to explain the short

history of conflict in Kosovo and the deliberate destruction of cultural heritage on its territory. Serbian and Albanian coexistence brought permeation of cultural influences, as well as destruction of marks of other cultures during conflicts, regardless of their cultural and historical value for civilization. Despite all efforts of the international community (military and civil), conflict is still violent and ongoing [1–3].

The permanent dialog between Kosovo and Serbia in Brussels has a visible result. Numerous agreements are signed, but region still is recognized as a post-conflict zone. In the period 2011–2016, within the European Union (EU) led dialog, Kosovo and Serbia reached 38 agreements. Based on the adopted classification 10 agreements are considered political, and the rest 28 are technical [4]. Both Kosovo and Serbia are not members of the European Union. The Republic of Serbia (RS) has been an EU candidate country since 2012, and Kosovo formally applied to join the EU in December 2022.

The sad fact is that the management of cultural heritage was not a subject of any of those signed agreements. Finally, in the last, promising Agreement on the path to normalization between Kosovo and Serbia (Agreement) that the legacy of the past is overcome, cultural heritage finds its place. Serbian religious and cultural heritage sites will be protected in line with existing European models [5].

The different views of Parties (Serbian and Albanian) related to cultural heritage protection are visible. Serbia considers Kosovo its Holy Land, the "Serbian Jerusalem," due to a large number of Orthodox churches and monasteries found there, since the Albanian side believes that this cultural treasure inherently belongs to Kosovo and that the Orthodox monasteries were built on the foundations of "Illyrian" temples. Therefore, it is clear that the issue of cultural heritage paralyzes the sustainable development of Kosovo and Serbia [6].

The hypothetical assumption of this chapter is that the protection of rich cultural heritage sites in Kosovo needs a common policy, an adequate strategy for cultural heritage sites management. Bearing in mind the numerous current problems of the society after a long-standing conflict, it is not an easy task. The author analyzes the cross-disciplinary, joint efforts of interested parties in the heritage sites management, and the way of its improvement. The main goal of this chapter is to address the current state of cultural heritage management through the lens of an ongoing process of seeking a final solution for the Serbia-Kosovo conflict.

In 2006, World Heritage Committee (WHC) put medieval monuments in Kosovo on the List of World Heritage in Danger (List). Except Dečani Monastery they added also the Patriarchate of Peć Monastery, the Gračanica Monastery, and the Holly Virgin of Ljeviška Church. Medieval Monuments in Kosovo dating from the thirteenth and fourteenth centuries were placed of the List due to difficulties in its management and conservation stemming from the region's political instability. The WHC requested that the State Party Serbia work with United Nations Educational, Scientific and Cultural Organization (UNESCO) programs with the United Nations Mission in Kosovo (UMNIK) and with the Provisional Institutions of Self Government (PISG) in Kosovo in caring for the site [7]. Those four monasteries listed on the UNESCO List of World Heritage in Danger because of "unsatisfactory state of conservation and maintenance of the property," and also "difficulties to monitor the property." They are on the same list from 2007 till today (2024).

Faced with obstacles in the management of heritage sites in hostile environment is clear that interested parties lag behind on recent advances and new perspectives in safeguarding and preserving the world's cultural heritage with special emphasis on modern protection strategies, use of advanced conservation materials, and technology in the improvement and conservation of the building and construction heritage

materials, which are the topics of the book titled: "Safeguarding the World Culture Heritage -Advances and new Perspective". Hence, even with the obvious unfavorable environmental, geological and geotechnical effects on cultural heritage sites, there are no heritage impact assessment needed for adequate protection of cultural heritage (CH) [8]. Kosovo Geological Service (KGS) is challenged by insufficient number of professional staff and technical resources as well as financial possibilities. A similar state is in the two most important institutions in charge for management CH: Ministry of Culture, Youth and Sport (MCYS), and the Institute for the Protection of Monuments (KIPM).

During the preparation of the chapter, the author had in mind that there is no perfect, all -in-one methodology for the field of this kind of social research because it represents different ways of observing and understanding social reality. Hence, the author used methodologies adequate for social science research.

The chapter structure is as follows: the introduction explains the current state of the link between ongoing conflict and issue of inadequate world heritage sites management, the importance of legal tools for safeguarding cultural heritage for all ethnic groups who live and work in Kosovo and Serbia, followed by the next part devoted to the literature. The third part explained used methodology needed for critical instance case study analyzes. The fourth part briefly presents the damage to cultural heritage objects after the military intervention in Kosovo. Kosovo faced with challenge how to protect it in the period 1999–2024. Serbia financed some of the very important works in reconstruction on some heritage sites, like Banjska, Gracanica, and a few others. This is followed by conclusion and references. Final recommendations are aimed to force Kosovo institutions to work more efficiently to protect CH. Serbia and Kosovo have to create common heritage protection policy and adopt of a new approach to prevent current threats and obstacles in process of the management of heritage sites.

The results confirmed an urgent need to implement a specific cultural heritage protection strategy in practice. Despite adopted legislative, institutional activities are insufficient, characterized by fragmented responses and sometimes misunderstandings with Serbian Orthodox Church (SOC), which is the owner of the world heritage sites mentioned above. In the future systematic approach will be helpful to overcome the past and act in accordance with positive practices from the EU. Protection of cultural heritage should be based on WHC guidelines for cultural heritage in danger. Both countries have to determine the process of heritage protection and preservation and contributed the building of peaceful society which strive to achieve sustainable development and conciliation. Agile governance is important prerequisite for success in the area of heritage protection, and accept a diversity of culture as a design for living.

Implementation of cultural heritage policies based on the European regulation will form a solid basis for adequate responses to the existing threats and challenges in a sensitive post-conflict society. The new generation should not be teaching a culture of hatred and intolerance rather than one of unity and economic progress.

2. Related literature

Most of the literature regarding this chapter, cultural heritage management in a conflict zone, is available and closely linked with a dynamic history of the Republic of Serbia and neighboring countries. Hence, the literature review was conducted to identify empirical or nonempirical article. The author presents the most important references, followed by the historical development of the research subject

and dynamic changes in the Balkan region, where Serbia and Kosovo are situated. Literature incorporating cross-cutting themes stated in the old days when scientists tried to understand the people and history of the Balkans; through different states till formally broke of the Socialist Federal Republic of Yugoslavia (SFRY) after the Yugoslav Wars on April 27, 1992. Particularly, the author addressed the events after the North Atlantic Treaty Organization (NATO) intervention against Serbia in 1999, and an ongoing quarter of the twenty-first century, the so-called "frozen conflict" between Serbia and Kosovo.

Mary Edith Durham recognized a cultural richness of the region and addressed her impression about cultural interaction in South East Serbia (Serban and Turkish). In her book, she left us amazing descriptions about "the Patriarchia of Pech, formerly the seat of Archbishop of Servia…made dependent on the Patriarchate of Constantinople in 1766 by the Turkish Government." She also visit the Visoki Dečani Monastery and wrote that "Dechani dates from the palmy of Servian empire, and is the finest monument" [9].

Conflict which was inevitable affects the cultural heritage in a dramatic way. Both Kosovo and Metohija (KiM) are famous for their enormously rich cultural heritage of all nationalities and minority groups. The majority of those objects belong to the Serbian Orthodox Church. It requested the care and protection of religious objects, some 1.300 monasteries and churches, fortresses, royal palace, and etc. [10].

The 1999 war over Kosovo made Serbian CH as a permanent target of Albanian extremists. The loss was great for humankind in general as well as for Serbian Christianity [11]. The author follows this idea by addressing the need of the preservation of cultural heritage for sustainable and peaceful society after the end of conflict. Hence, Kosovo CH has significance from cultural and economic perspectives, there is an urgent need to define the priorities of preserving the rich cultural heritage for future generation and providing implementation of the sustainable development goals (SDGs). For example, SDG 11 is very important for building a successful and democratic post-conflict society [12, 13].

The specific part of examined literature belongs to the explanation of the current development of the governance of Kosovo, after controversial unilateral secession from Serbia on February 17, 2008. The Council of the European Union (CoE) adopted a Joint Action creating the European Union Rule of Law Mission in Kosovo (EULEX), the largest and the most important mission thus far undertaken within the common European foreign and defense policy. EULEX substituted the rule of law functions of the United Nations Mission in Kosovo (UMNIK) which was created for an open-ended period of time by Security Council Resolution 1244 under Chapter VII of the United Nations Charter [14].

Two of the most influent organizations, UNESCO and the Organization for Security and Cooperation in Europe (OSCE) have paramount importance for the process of capacity building in areas of democratization and human rights in "the new society". For the last 25 years, the OSCE Mission in Kosovo contributed to capacity building of the public institution in Kosovo and successful ways to protection of cultural heritage. They published the "Guidebook on standards for drafting of cultural heritage management plans" in 2020 and specific report on "Protection of Cultural Heritage in Kosovo" which concludes that the effective protection of cultural heritage in Kosovo should not be limited to physical restoration [15, 16].

Despite management plan were created for all listed properties in a moment of their nomination on UNESCO List, their realization is hampered by the current political situation in Kosovo.

Professor Miroslav Stanojlović wrote the book "Gračanica chronicle of the painting and conservation works: 2010-2018 to present the audience" team efforts to the conservation of frescoes in the southern chapel, wall paintings in the main church dedicated to the Assumption of the Blessed Virgin Mary, and the restoration of the Gračanica Charter [17]. Related to the security situation in Kosovo, there is a need to explore a literature related to the protection and management of heritage sites' strategies of using sustainable building materials to limit visits, and prevent noise which affect CH. Yildrim in his work discuss the idea that UNESCO should develop environmental exposure guidelines that incorporate noise and emphasize instruction and regulation in conjunction with build and nature-related features. In that way, the sound identity of heritage sites will be preserved, and so multi-disciplinary approaches can be used to establish a more compelling platform for such purposes [18].

Information and communication technology (ICTs) become a very valuable tool for use in many countries to teach cultural richness, disseminate traditional symbols specific to the culture of each region and as a method of digital protection of cultural and intangible heritage [19]. The development of ICTs notably contributes to the public understanding of the past and to the evolving social significance of heritage itself. Belgrade and Prishtina have a chance to use digital ICTs as a tool for the improvement of its cultural tourism competitiveness in the regional and EU tourist market [20].

In Europe protecting CH from the consequences of disasters is a great issue. So, they finance a project (2019–2021), coordinated by the Italian Civil Protection Department (IDPC), in collaboration with the International Centre for the Study of the Preservation and Restoration of Cultural Property (ICCROM) and partners from Turkey, Spain, Germany, Portugal, and France. The specific results of this project are a proposal for "Key elements of a European Methodology to Address the Protection of Cultural Heritage during Emergencies" Specific part of the project is devoted to a brief overview of the risk affecting cultural heritage assets like: hydrogeological; hydraulic risk; volcanic risk; fire or explosion risk, and seismic risk [21].

Protection of CH in Kosovo despite all efforts of the international community and other interested parties is a political issue because the Serbian Government is against the membership of Kosovo in the UNESCO, as well as in other international organizations. Hence, in that status quo state, both sides are unable to increase awareness of need to stop the promotion of the concept of cultural heritage which contributes in the renewal of nationalist movements, extremist and even chauvinistic grass-root organizations. Solutions to adequate protection of CH and resource management issues could be achieved by acknowledging differences and legitimating conflicting interests, so as to seek common ground [22, 23].

3. Materials and methods

The safeguarding of CH is one of the grand challenges of the contemporary world, particularly in conflict zones. In order to address the complex issue related to the protection of rich cultural heritage in Kosovo author used critical instance case study analyzes. The study approach makes use of multiple methods adequate for social science research (systematic observation, content analysis method, historical method, comparative method, and field research). All sources, primary and secondary are classified in groups based on the period of its creation, before the war, during the war, and those published after the conflict. The official publications of the relevant authorities in Serbia, Kosovo, the EU, and broader international community were

examined. Relevant scientific literature was searched from libraries and through different websites. The documents were also collected from electronic sources: Literature Resource Center like Go Gale Group EBSCOHost, Academic OneFile, e-Library, and websites.

This study is related to the events and changes in the area of politics, heritage protection and cultural policy in social sphere which happened in Serbia, Kosovo and EU during the period 1999–2024. Protection of world's heritage sites in danger is a question of paramount interest for the future relations of Kosovo and Serbia, as well as for whole region. At the same time, the cultural heritage is immersible resources for the future sustainable development and reconciliation among all ethnic groups who live in Kosovo.

4. Results

4.1 Challenges of cultural heritage protection in Kosovo (1999–2008)

Cultural heritage devastation that happened during the war and in the postwar period is well recorded by many interested parties. After international intervention, the United Nations Security Council Resolution 1244 (1999) calls for "substantial autonomy and meaningful self-administration for Kosovo". The future status of Kosovo has to be defined in the future [24].

Kosovo inhabitants expected that under the UNMIK and Kosovo Force (KFOR), and with the assistance of the EU and the Organization for Security and Cooperation in Europe (OSCE), as well as with other relevant international organizations, they will have fundamental human rights and freedom of movement for all, regardless of their ethnic origin or religious affiliation. Hence, author's view related to the subject of paper is that it is more useful for clarification of the theme to briefly present what happened in those two different periods and what kind of changes those acts initiated in the local and global community.

Those periods are:

- The first period is linked to events immediately after the end of the armed conflict and, after signed Kumanovo Military Technical Agreement between the KFOR and the Governments of the Federative Republic of Yugoslavia (FRY) and the RS in Jun 9, 1999 [25].

- The second period is after February 17, 2008 and Kosovo unilateral declaration of independence, till today. The International Court of Justice (ICJ) made a decision that this declaration of independence from Serbia did not violate international law [26].

European experts reported about the cultural situation in Kosovo after the military intervention and found that "some Orthodox churches and monasteries have been damaged or destroyed, not so much by the North Atlantic Treaty Organization (NATO) bombing campaign but as a result of criminal acts by returning Albanians" [27]. The Monastery of Dečani had survived thanks to the presence of Italian troops who happened to be stationed in the area, acting not on orders but in response to appeals from the monks of Dečani. French troops had similarly saved the monastery of Devič [28].

Recently after the 1998–199 conflict in Kosovo allegations were made by various parties concerning the destruction of cultural heritage. One among many of projects was particularly important. This was the Kosovo Cultural Heritage Project, started in July 1999, financed by a grant from the Packard Humanities Institute and sponsored by Harvard University. Project leaders, Herscher and Riedlmayer created a specific database about destruction of CH in Kosovo (1998–1999) and identified five categories of cultural heritage at risk [29]. He addressed that one of the major obstacles for reconstruction of CH in that period, was the fact that UN agencies in charge in Kosovo did not have a budget for reconstruction projects and the fate of cultural heritage has not ranked very high among the international community's concerns. Except a lack of funding reconstruction, another important reason for inadequate protection was a lack of expertise [30].

Therefore, it is reasonable why in 2000, the CoE started its activities in the field of cultural heritage, as part of an agreement signed with the European Commission (EC) to assess the situation of the cultural heritage in Kosovo. It was the first step to help the authorities (international and local) in defining priorities and guidelines for a future heritage policy. The recommendations proposed are in the perspective of an improved coordination between international partners and aim at engaging rapid legal and administrative reforms through a middle-term action plan of transition [31].

The Yugoslav Government and Professional Institutions for cultural heritage protection as well as SOC presented facts about the destruction of cultural heritage in a different form of books, reports and statements [32, 33]. Thanks to the efforts of the Ministry of Foreign Affairs to initiate the visit of the UNESCO expert mission in March 2003, this issue arose in the international community. Mission created a report entitled Cultural Heritage in Kosovo-Protection and Conservation of a Multi-Ethnic Heritage in Danger [34]. The Mission visited more than 40 selected sites in Kosovo and identified three different factors to account for "the present sad state" of the cultural heritage sites: (1) intentional destruction by dynamite, shelling and fire; (2) vandalism and looting, and (3) the process of normal aging and decaying of all monuments, aggravated by environmental pollution and significant neglect of protection and preservation. Those two missions were important because initiated the further actions of all actors involved in the hard task of protecting CH in the post-conflict zone, where people still bear the scars of the recent past.

Unfortunately, the destruction of CH continued in the post-conflict period and exploded between March 17 and 19, 2004 [35]. Many religious objects, property of the Serbian Orthodox Church are destroyed, and one of them, the monastery of Holy Archangels which contained the tomb of King Dušan, from the fourteenth century, was burned and looted [36]. Today, German soldiers surrounding the monastery complex maintain a security zone (**Figure 1**).

The Dečani monastery was put under the protection of the Italian Army, and remains under the protection of international forces because of serious safety risks. Since 2013, other important CH sites have been protected by the Kosovo police force. This fact confirms that there is no improvement in the political stability. Thanks to KFOR military convoys occasionally the monastery is visited also by Serb pilgrims from Kosovo and Central Serbia (**Figure 2**).

Despite many interested parties in the area of CH protection, it is not adequate because numerous prerequisites are still missed. All actors continued to constitute a solid basis for any knowledge-based decision-making process to establish priorities of cultural heritage protection. The most important actors are presented in **Figure 3**.

Figure 1.
(a and b): Holly Archangel monastery (fourteenth century) Figure a, and Figure b approaching the monastery, reconstructed living quarters in the background. Source: Serbian Orthodox Diocese of Raška and Prizren, 2024.

Figure 2.
(a and b): Dečani monastery (fourteenth century) Figure a, and Figure b: Modern tanks around the medieval walls (August 2001). Source: Serbian Orthodox Diocese of Raška and Prizren, 2024.

UNESCO recognized the significance of the protection of CH and predicted "that it has not been possible so far to ensure the long-term protection and preservation of cultural heritage in Kosovo" [37]. One among many other reasons is that the CH protection in this period was not a priority task of interested parties. The Cultural Department of UNMIK complained about their lack of means while the other actors in the field complained about the lack of policy from the part of the Cultural Department. It was quite clear there was no cultural policy, no overall view and no agreement on how to change the situation. PISG and MCYS in that period were unable to perform proclaimed activities in the area of protection and preservation of CH because of the scarcity of resources, (financial and human). Hence, the organization of institutional system of cultural heritage protection was at the beginning of long and uncertain path. The reconstruction has to begin from the start, rebuilding all ruined churches, monasteries and mosques from the ashes.

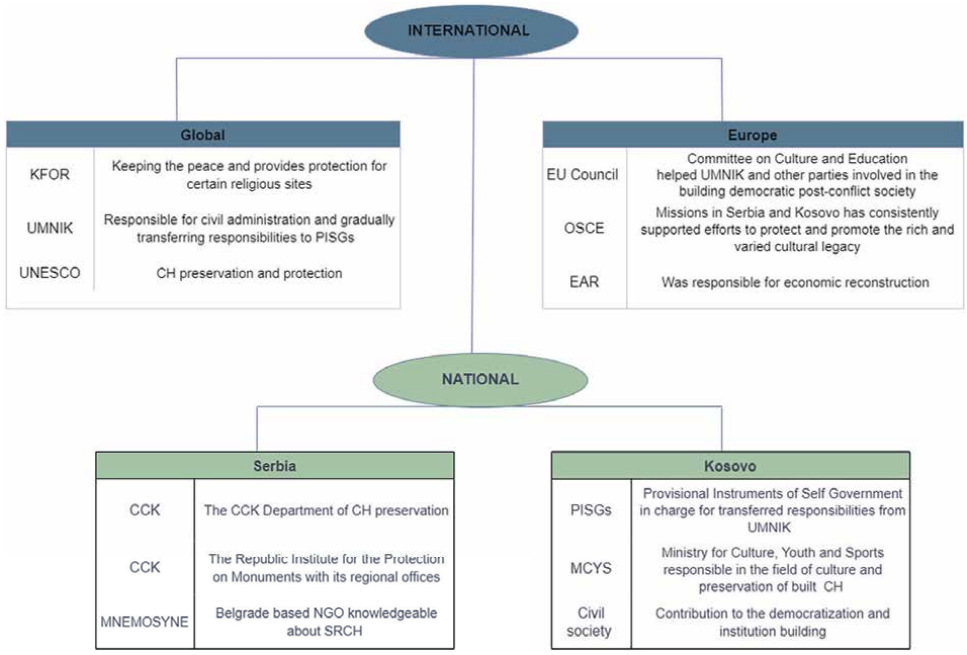

Figure 3.
The most important actors in Kosovo in charge for CH protection, Source: Author.

4.2 Protection of CH in Kosovo (2008–2024)

Historic monuments in Kosovo have been systematically targeted due to their high visibility and association with national identity. Dečani Monastery and Hadum Mosque are one of many who received attention from the international community [38]. We witnessed that even 25 years after the end of the conflict the adequate management of cultural heritage is missed in Kosovo territory. OSCE Mission in Kosovo provided the written testimony about the state of protection of immovable tangible CH covering the period 2009–2014.

This period is characterized by the lack of legislative framework and limited cooperation between institutions [39]. Despite many cases of damaged CH, it is need to address that the legislative system of Kosovo recognized the risk of the protection of Serbian religious CH and so it was guaranteed in the Comprehensive Proposal for the Kosovo Status Settlement dated March 26, 2007 [40] and later in the Kosovo Constitution [41]. Policy and legal framework in Kosovo are upgrading and cultural heritage is protected in Article 9 of the Kosovo Constitution. It is needed to address that there are three laws referring to Serbian religious CH protection [42–44]. The establishment of two different bodies: Kosovo Council for Cultural Heritage (KCCH) and the Implementation and Monitoring Council (IMC) were also important for the future efforts in creation of adequate cultural policy, and management of heritage sites on a way which is acceptable for all interested parties.

Another important policy document for the protection, preservation, and promotion of cultural heritage is the National Strategy for Cultural Heritage 2017–2027 (Strategy), which addresses five objectives. It is only government currently in force that mentions explicitly the "full discretion" rights of the SOC. Those five objectives of the mentioned strategy are presented in **Figure 4** [45].

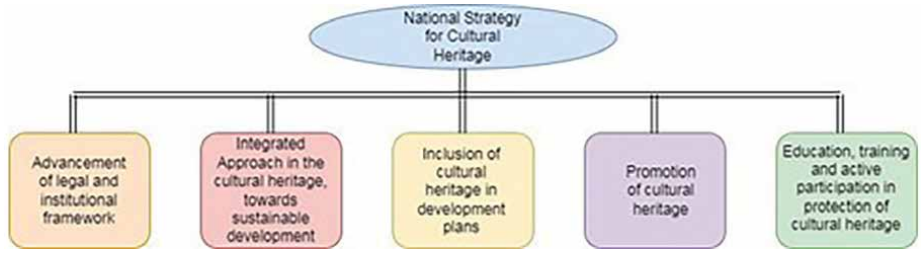

Figure 4.
Five objectives of National Strategy for CH. Author adaptation from OSCE, 2022.

The strategy is aimed to increase security on heritage sites [46] and create inter-ethnic trust and awareness of importance of cultural heritage in Kosovo for all its inhabitants. Representatives from international organizations are unable to develop plans and proposals for the integrated management of cultural heritage without considering the significant uncertainties surrounding their practical implementation. It is encouraging to note that the creation of the aforementioned strategy for the protection of cultural heritage involved contributions from expert institutions, civil society organizations, and all ethnic groups residing in Kosovo.

In 2015, Kosovo attempted to become a member of UNESCO but was not successful. It is prevented by resistance of the RS. Serbia hailed decisions as a diplomatic victory and claimed that Pristina does not have oral credibility for membership based on the claim of the Permanent Mission of the RS in the UN. Despite that "victory," Serbian experts today are not able to work on heritage sites without approval for the entrance into the Kosovo territory.

The facts confirmed that in Kosovo there is a lot of room for improvement of the efforts in the area of CH, especially in the case related to the current state of protection of Serbian religious CH on the list of World Heritage in Danger in 2006. Protection of all of them is not improved neither in the one determinate area of risks. There is no answer as to how it is possible, and what the reason/s for this failure in heritage management. Based on reports and data from **Table 1**, it is clear that all risk factors affecting the property are the same from 2007, excluding only 2020 year, when report was not created due to COVID-19 pandemic [47].

"Unsatisfactory state of conservation and maintenance of the property" does not mean that there were no conservation works on the heritage sites. Experts work on few heritage sites faced with numerous obstacles. Monastery Banjska is one of them.

Monastery Banjska is located near the village of Banjska in Zvečan municipality, north of Kosovska Mitrovica. The pious endowment of the Holly King Milutin, built in the thirteenth century. The beginning of the material restoration of Banjska lasted for decades, conducted sometimes successfully, and sometimes followed with misconception. Reconstruction often was a subject of numerous discussions, and even conflicts between the experts and SOC, who managed the property. The ninety-year-long

Factor affecting the property (2007–2024, except 2020)				
Civil unrest	Legal framework	Management systems/ management plan	Other threats	Unsatisfactory state of conservation and maintenance of the property

Table 1.
Factors affecting the state of medieval monuments in Kosovo (author).

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Figure 5.
Monastery Banjska, 2021. Credit, Borivoje Obradović, Belgrade.

history of research has found many questions pertaining to the architecture of the Church of Sent Stephan and other monastery structures. After restoration if religious life in 2004, archeological research continued, with an interruption followed by devastation and destruction of the monastery's remains (**Figure 5**) [48].

Gračanica monastery is the one which was permanently under reconstruction from 2011 till 2018 when team completed its works. Hence, the Gračanica monastery is at risk for further structural stability and air pollution caused by a frequent transport on near roads, further actions related to those risks are not observed.

The research works completed in period of July 30, 2011 and August 16, 2011. Experts noticed some damage on the frescos in the Holly Annunciation Church. They proposed two urgent actions: replacing the damaged roof and reparation of damaged areas. Based on the performed physical-chemical researches, salt characterization, measure humidity and determinate of dark sediments. The results were useful for cleaning the layers of dust and soot on frescoes. The Institute for the Protection of Cultural Monuments of the RS monitored the state conservation of Gračanica Monastery (**Figure 6**) [49, 50].

Risk assessment of Dečani Monastery was conducted by the International Council on Monuments and Sites (ICOMOS) in 2003. Experts stated that "the basic risks were related to aging process and decay caused by environmental agents. There was a possibility of earthquakes in this region, but the main risk is their potential impact on the mural painting" [51].

Kosovo is one of the most seismically active regions in Europe, lining within the Alpine -Mediterranean's tectonic belt. According to the Seismic Risk Map, Kosovo has three main seismic source areas: Prizren-Peja seismic zone, Ferizaj-Viti-Gjilan seismic zone, and Kopaonik seismic zone. Kosovo Geological Service (KGS) is like all other Kosovo institution recently established and is in charge to monitor and maintenance seismic network and compilation of the annual distribution map of the maximum seismic intensity. Therefore, there is an urgent need for this service to build technical capacities for geological analyzes and so cooperate and support activities at the local level in the area of cultural heritage protection. The ongoing case of the beginning of heavy construction works on the transit road from Dečani (Serbia) to Plav

Figure 6.
(a and b): Gračanica charter, 6a and 6b, placed deposits on wall. Source: Institute for the Protection of Cultural Monuments of the RS, Belgrade.

(Montenegro) Kosovo Government violates the law and endangers the heritage site, and monastery's land (**Figure 7**) [52].

EU insists that "Kosovo should improve implementation of legislation on the rights of non-majority communities, adopt the strategy for protection and promotion of the rights of communities, adopt the law on CH and the law on religious freedom, re-establish relations with the Serbian Orthodox Church and implement the Constitutional Court's decision of the Dečani Monastery" [53].

Having all mentioned above, is clear that monasteries were not a subject of the risk assessment research of experts in the recent past; risk management plans do not exist, and the whole process of integrated cultural heritage management is at the beginning. The issue of CH was not a part of the direct dialog between Belgrade and Pristina, and it looks that the solution is not a priority for policymakers. On contrary,

Figure 7.
The map of the planned road and borders of monastery's land. Source: Diocese of Raška and Prizren, 2024.

citizens in Serbia and Kosovo are very interested in the protection of CH in Kosovo. In this moment is obvious that the legislative of Kosovo institution now is mandatory for those monasteries, but despite that fact the numerous risks their state still stayed unchanged. The main reason for this state is that Kosovo` institutions are newly established and so yet inefficient due to lack of human, financial and technical resources.

It is expected that in recent future Serbia will accept the solution that Kosovo institutions will have the full competence and responsibility for the care of the Serbian cultural and religious heritage in Kosovo, following EU and international practice in the area of cultural heritage protection and preservation, like it was defined in the Article 7 of the Agreement. *The Parties (Serbia and Kosovo) shall formalize the status of the Serbian Orthodox Church in Kosovo and afford strong level of protection to the Serbian religious and cultural heritage sites, in line with existing European models* [54].

Hence, it could be reasonable to expect the based on Agreement, RS would not block Kosovo in the future attempt of accession to any international organization, like UNESCO and many others. The OSCE Mission in Prishtina proposed the needed guidelines for the preservation of cultural heritage, and now we can just wait and see how likely is that some time will improve in the future, and see visible changes in this area.

5. Discussion

Local wars and conflicts are threats that jeopardize the sustainable future of many countries in the world. Serbia and Kosovo could be one, among many other examples. Therefore, the inclusion of sustainable development goal, number 16 (SDG16-*Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels*) in the 2030 Agenda for Sustainable Development represents a fundamental shift in the global development landscape through the recognition that there can be no sustainable development without peace and no peace without sustainable development [55].

Culture is essentially about a way of life. It is a celebration of what community is, where it has come from where it is going-its identity and memory [56]. Hence, the issue of protection and preservation of cultural heritage in Kosovo post conflict period, represent a sensitive subject, need to be dealt with carefully because it is likely to cause disagreement among numerous interested parties.

Cultural heritage embodies the identity of communities and also produces economic benefits. It is important to address that the EU tourism policy identified cultural tourism as a driver for sustainable social and economic development. Cultural tourism is one of the fastest growing kinds of tourism in the modern world. Population from Serbia and Kosovo are aware of the importance of CH for their economic progress. Despite the lack of official data, one of the conducted research projects in Kosovo and Serbia confirmed that citizens are aware of the importance of CH. Citizens from Serbia and Kosovo from different cities participated in survey (from November 2016 to March 2017) whose data were used for research needed for doctoral thesis. The two questions from survey are important for this chapter:

1. How do you evaluate the importance of protection of CH for economic progress?

2. How do you evaluate importance of security and infrastructure for the development of cultural tourism in Kosovo?

Answers (scale from 1 to 5) confirmed that the population understands the importance of protection of CH for their economic progress, and recognizes how adequate infrastructure and security on heritage sites are important for the development of cultural tourism in Kosovo. The results are presented in **Table 2** [57].

It is reasonable to admit that the current approach taken and the overall situation in cultural heritage preservation in Kosovo is complex due to current political implications. The unchanged state of the world's heritage sites in Kosovo shows that it is not just a simple task that will be done by following the management guidelines prepared by the WHC. Hence, the principle of effective management has to be applied. It involves a cycle of short, medium, and long-term actions to protect, conserve, and present the property [58].

In Kosovo, restoration and conservation works started from the rebuilding. It is not easy to complete works staying in those objects isolated and surrounded by barbed wire and armed people. Providing security on heritage sites is a hard task for Kosovo Police. Hisari and Fouseki addressed that "the domination of a one-sided approach whether from local institutions, organizations, or from professionals and opinion makers from both sides, only fed into the anyway fragile inter-community and a political situation." The discourse shows reluctance to recognize reality on the ground and to recognize the accurate histories of sites [59].

Preparation of a management plan should be based on consultation of both sides because they shared research and information-oriented sources and are familiar with managements-oriented sources. There are a few points where collaboration should be mutually beneficial, for example in the process of digitization CH. Serbia established the Information System of Immovable Cultural Property to store digital and digitized data of immovable heritage of the RS. Based on decades of previous cooperation in one country, and legal obligation to take care of protection and preservation of the SOC objects, is reasonable to establish a specific network for knowledge sharing. In the future experts could work together, like they have already done, before the conflict.

All interested parties have to organize efficient experts' teams, able to seriously work on the valorization of cultural heritage and effective communication in a multiethnic and multi -confessional environment. Valorization is important in order to clearly define the priorities in the process of preserving the rich cultural heritage in Kosovo for future generations.

Experts have a task to include in their plans infrastructural, environmental, physical, ecological environment, legal, political, economic, socio-cultural, and technological environment. Based on the "frozen state" of management heritage sites in danger, experts have to agree on risk management process. The first step has to be the identification of risks and agreeing on dealing with them without any prejudices. All parties have to be aware that the preservation of irreplaceable cultural heritage sites cannot be managed without interdisciplinary cooperation. Experts from Belgrade and Prishtina should participate in the process of the integral management of cultural heritage sites on a way to strengthen commitment, building knowledge and capacity,

Number	**2**	**3**	**4**	**5**	**Average**
1st question	2.3	16.2	49.2	32.3	4.12
2nd question	0.8	26.9	48.5	23.8	3.95

Table 2.
Numerical results (answers) on questions.

and use of ICTs and other modern technologies. In the future, we have to witnesses integrating experts' efforts in the field of cultural heritage in danger, and joint education of new generation of experts.

6. Conclusions

Cultural heritage in Kosovo is in risk even a quarter century after the conflict. Kosovo is still country at the stage of post-conflict management. There are many books, articles, and reports about discussion of the role of the international community in the area of management cultural heritage. Hence, the UN and NATO intervention made numerous changes and influence in global and regional policies in many areas, and so far in the area of protection and preservation of cultural heritage. Kosovo is one of the specific cases in the global community where trained military forces protect the world's heritage sites. The consequences of the horrible destruction of CH have to be completely eliminated.

The Kosovo society from 2008 is characterized by constant change and uncertainty. In this dynamic environment, the concept of future cultural policy is finally adopted. The current legislative is in accordance with the positive practices in the EU. Pristina has to implement numerous corrective measures, eliminate current risk on the world's heritage sites, and become more efficient in the process of developing new integrated management plans and strategies.

Both parties, Belgrade and Pristina have to address key challenges in cultural heritage protection, together with SOC. They have to stay focus on design, deployment and sharing of traditional and scientific knowledge needed to the protection of CH.

In those actions, they have to conduct new research methodologies and techniques for protection, reconstruction, and conservation of CH. Joint actions related the use of digital technologies based on EU Communication "2030 Digital Compass: the European way for the Digital Decade" create more possibilities for reusing cultural assets for innovative and creative services.

Belgrade and Pristina should increase dialog and consultation to promote cultural diversity, and make cultural tourism as an integral element of country's sustainable development.

Policymakers have to provide deepen cooperation for the protection of CH and provide cultural interaction and positive energy for peaceful co-existence for all ethics groups that live in Kosovo.

Prishtina needs to avoid irreversible damage to the Dečani monastery with the surrounding landscape and avoid the damage to the authenticity and the integrity of the other heritage religious site. The laws have to be respected and eliminate the current lack of risk heritage impact assessment.

Institutions in Kosovo, like Kosovo Geological Service, KIPM, and MCYS are obliged to create and monitor specific-heritage protection measures, eliminate lack of transparency and establish a regular flow of consultation with experts, donators, and owners of CH.

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Notes/additional information

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Abbreviations

CoE	Council of Europe
CH	Cultural Heritage
EC	European Commission
EU	European Union
EUSR	European Union Special Representative
EULEX	European Union Rule of Law Mission in Kosovo
IDPC	Italian Civil Protection Department
HIA	Heritage impact assessment
ICOMOS	International Council on Monuments and Sites
ICCROM	International Centre for the Study of the Preservation and Restoration of Cultural Property
ICTs	Information and communication technologies
ICJ	International Court of Justice
IMC	Implementation and Monitoring Council
NATO	North Atlantic Treaty Organization
KCCH	Kosovo Council for Cultural Heritage
KGS	Kosovo Geological Service
KIPM	Kosovo Institute for the Protection of Monuments
KiM	Kosovo and Metohija
KFOR	Kosovo Force
MCYS	Ministry of Culture, Youth and Sport
OSCE	Organization for Security and Co-operation in Europe
PISG	Provisional Institutions of Self-Government
RS	Republic of Serbia
RIC	Reconstruction Implementation Commission
SAA	Stabilization and Association Agreement
SFRY	Socialist Federative Republic of Yugoslavia
SOC	Serbian Orthodox Church
SC	Security Council
SDG	Sustainable development goals 2030 of UN
SPZ	Special protective zone
UN	United Nations
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNMIK	United Nations Interim Administration Mission in Kosovo
WHC	World Heritage Committee

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Chapter 4

Thermal Weathering and Assessment of Marble Stones in Heritage Structures

Swathy Manohar and Anupama Ghimire

Abstract

This chapter explores the primary degradation mechanisms observed in marble stones within heritage structures, focusing on flaking, spalling, uneven surfaces, mass loss, and staining. These manifestations are attributed to increased porosity resulting from various environmental exposures. A detailed analysis of these mechanisms is presented, with a particular emphasis on heritage structures in hot semi-arid climates, including the Taj Mahal in India. Thermal weathering emerges as the most significant factor contributing to marble deterioration in these regions. Laboratory simulations replicating the identified damage mechanisms provide quantifiable insights into their impact on the microstructure and pore structure of marble. Comparative studies between fresh and artificially weathered samples reveal decreased ultrasonic pulse velocity and increased water absorption, correlating with observed degradation patterns such as flakiness and mass loss. This chapter concludes with an overview of thermal weathering mechanisms, their manifestations, and the testing methods employed to quantify their effects.

Keywords: thermal weathering, marbles, stones, heritage, conservation, microstructure, accelerated weathering

1. Introduction

Building stones begin to weather from the moment they are extracted from the quarry and used in construction, undergoing structural and compositional changes as they seek a new thermodynamic equilibrium. In addition to these natural changes, chemical and biological weathering processes can further impact their durability, affecting their use as structural and ornamental materials. Marble, a stone historically valued for its low porosity and high quality, has been employed in many prominent civil and religious buildings. However, despite its reputation for durability, numerous historic marble structures and sculptures now show signs of weathering, primarily due to thermal decay and the subsequent action of soluble salts. Notable examples include the churches of San Marco, Santa Maria del Giglio, and Santa Maria dei Miracoli in Venice, Michelangelo's David in Florence, and the Courtyard of the Lions

in the Alhambra of Granada [1]. This paper examines the weathering phenomena affecting marble in heritage structures, focusing on the underlying mechanisms and their implications for conservation. The decay of building materials is characterized by the gradual deterioration of their physical, chemical, and mechanical properties, often leading to structural failure. This degradation process occurs at material interfaces and is influenced by both intrinsic and extrinsic factors. Intrinsic factors include the material's type, properties, distribution, origin, processing history, and compatibility with other materials. Extrinsic factors encompass climate variations, microclimate conditions, atmospheric environments (urban or marine), water-related actions such as rain and salt crystallization, and structural loads [2].

Marble, a material commonly used in heritage structures, is particularly vulnerable to discoloration due to various factors. These include the formation of black crusts from acid rain dissolving calcium carbonate and depositing gypsum, particulate matter penetrating marble pores, stains from metal exposure, biological growth that forms colored patinas, and aging protective coatings from previous restoration efforts [3]. While degradation over time is inevitable, the rate at which it occurs can be controlled, making it a critical area of study. The complexity of degradation mechanisms means that different environmental agents—such as wind, salt, humidity, and substrate conditions—can result in varying manifestations of damage. Furthermore, degradation often arises from the combined effects of multiple factors [4]. Therefore, simple visual observations are insufficient for deducing all the underlying causes of damage. However, a systematic approach that includes visual observations and damage documentation, followed by surrogate testing methods such as non-destructive testing or micro-analytical material characterization, can provide a clearer understanding of the underlying mechanisms.

Understanding these mechanisms is essential for assessing the significance and impact of various degradation processes on a particular structure. In the context of heritage structures, numerous external factors contribute to their degradation, including environmental conditions (humidity, water seepage, and temperature fluctuations), tourist interference (wear and tear, vandalism, and surface contact), biological growth (algae and vegetation), historical modifications (e.g., wartime anchors), and poor air quality. In addition to these external factors, the inherent properties of the materials themselves also play a role in the degradation process. For instance, marble's porosity allows liquids to permeate, leading to acid attacks that dissolve calcium carbonate, resulting in surface dulling and texture changes. Moisture can cause efflorescence, a powdery residue, and thermal stress can induce cracking when grain sizes fail to return to their original position after heating. Understanding both external and internal factors is crucial for developing effective conservation strategies for heritage structures. The study systematically documents the major damage manifestations in marble heritage structures through detailed visual assessments and documentation, while also correlating the observed damage with underlying causes and outcomes.

2. Visual observations and damage documentation

To understand the degradation of marbles in hot semi-arid climates, the primary approach involves visually identifying the damage. This section presents observations from the Taj Mahal, a UNESCO World Heritage site and one of the New Seven Wonders of the World, alongside similar observations from the Jaswant Thada, a prominent cenotaph in Rajasthan India and also known as the Taj Mahal of Marwar. Both monuments share a comparable climate. These structures utilize Makrana Marble, white

marble from Rajasthan (with a mineral composition of 50–56% CaO, 0.8–1.8% MgO, 0.33–1.2% SiO_2, 0.1–0.28% Fe_2O_3, and 34.8–43.2% of loss on ignition [5]), with maximum calcite content, as cladding material for both external and internal surfaces.

2.1 Flaking, spalling, and disaggregation of marble

The monument's marble surfaces exhibited flaking, spalling, and disaggregation (also known as sugaring), primarily on the exterior surfaces, as illustrated in **Figures 1** and **2**. A possible cause for this can be considered as the use of incompatible topcoat linings. According to the maintenance report presented by Archaeological Survey of India Agra Circle in 2002 to UNESCO, the Archaeological Survey of India (ASI) applied water-tightening silicon chemicals to various parts of the structure [6]. The selected topcoat may have had compatibility issues with the underlying material, leading to degradation rather than preservation. Although no specific records exist for Jaswant Thada, the Mehrangarh Museum Trust, which is responsible for its maintenance, may have used similar preservation techniques. According to Urzi [7], scaling is observed in decayed marbles due to the intercrystalline growth of microorganisms. Acid rain could also be a contributing factor to the spalling of marble at the Taj Mahal, particularly considering the presence of industrial setups in nearby areas leading to increased air pollution and

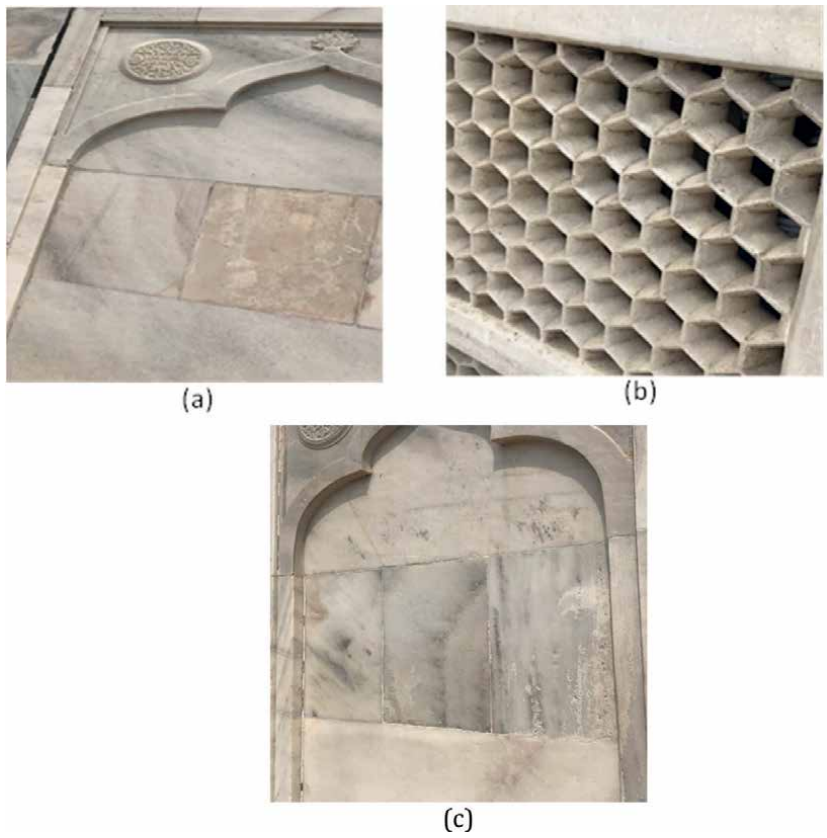

Figure 1.
(a) Flaking observed on the marble slabs placed on the vertical wall of the main mausoleum of the Taj Mahal. (b) Disaggregation observed on the intricate net openings placed at the entrance of the main mausoleum at the Taj Mahal. (c) Spalling and disaggregation observed on the vertical slab placed on the exterior wall of the Taj Mahal.

Figure 2.
(a) Spalling and disaggregation observed on the horizontal slab placed on the exterior wall of the Jaswant Thada. (b) Spalling and disaggregation seen on the exterior walls of the Jaswant Thada.

subsequent acid rain in the region. The disaggregation may also result from the diverse modifications and techniques employed over the years to clean the marble [8].

2.2 Uneven surface

Severe deterioration, characterized by black dotted markings, was observed on the floor marbles of both the Taj Mahal and the Jaswant Thada, as illustrated in **Figure 3(a)** and **(b)**. This deterioration manifested as uneven surfaces, a darker (black) coloration, and disintegration of marble pieces. The uneven surfaces and pitting effects observed are typically attributed to surface abrasion. Abrasion, in turn, can be attributed to factors such as continuous tourist foot traffic, exposure to acid rain, and air pollution. As the stone surface undergoes abrasion, it exposes the inner layers of the marble to the atmosphere, leading to differential erosion that results in uneven surfaces. According to the study carried out by Lal et al. [9], the air quality of Agra is degrading with high levels of particulate matter (PM) deposited on its surface. These depositions on the

Figure 3.
(a) Pitting and uneven surface observed on the exterior floor slab of the Taj Mahal. (b) Pitting and uneven surface observed on the exterior floor slab of the Jaswant Thada.

marble surfaces, pits and undulation formed by abrasion cause discoloration of the surface. The gathered substances function as nourishment or source of energy for many microorganisms. Based on their distinct characteristics, endolithic and epilithic microorganisms create various corrosion patterns, such as decay, channels, and pitting, at the unit calcite crystal level. Hence, the darker hue is the result of either the accumulation of dust in the created pits or the secretion of microorganisms.

2.3 Darkening and staining of marble walls

Figures 4–**7** illustrate darkening and staining in marble, potentially caused by efflorescence and improper cleaning. In addition to that, plain surfaces shielded from direct sunlight exhibited brownish, yellowish, and blackish stains (**Figures 5** and **6**). The discoloration of white marble can be attributed to the oxidation of iron sulfides and iron oxides, with the resultant products manifesting as distinctive orange, yellow, and brown stains on the marble surface. Furthermore, alkaline solutions application

Figure 4.
(a) Dark brown and black stains observed on the exterior wall on the entrance gate of the Jaswant Thada. (b) Brown stains observed below the window sills on the exterior walls on the Jaswant Thada.

Figure 5.
(a) Orange to brown stains observed on the interior walls on the Taj Mahal. (b) Orange stains observed on the interior surfaces of one of the small cenotaphs placed nearby the main cenotaph on the Jaswant Thada.

Figure 6.
Brown stains and black stains observed on the floral-decorated interior walls of the Taj Mahal.

Figure 7.
(a) Brown stains observed on the exterior slabs around the main mausoleum of the Taj Mahal. (b) Brown stains observed on the interior slabs of the main cenotaph of the Jaswant Thada.

on the white Carrara Marble has been documented to induce a transformation from its natural state to a yellow-orange hue [10]. Similar transformation can be anticipated for Makrana Marble as well. Yellow stains observed in various areas of the structure, albeit lacking a discernible pattern, may arise from the rusting of iron dowels positioned between marble slabs and the masonry structure in the Taj Mahal.

At the Taj Mahal, very small green-black spots were seen in the marble's surface, particularly facing the Yamuna River as shown in **Figure 8(a)** and **(c)**. Upon

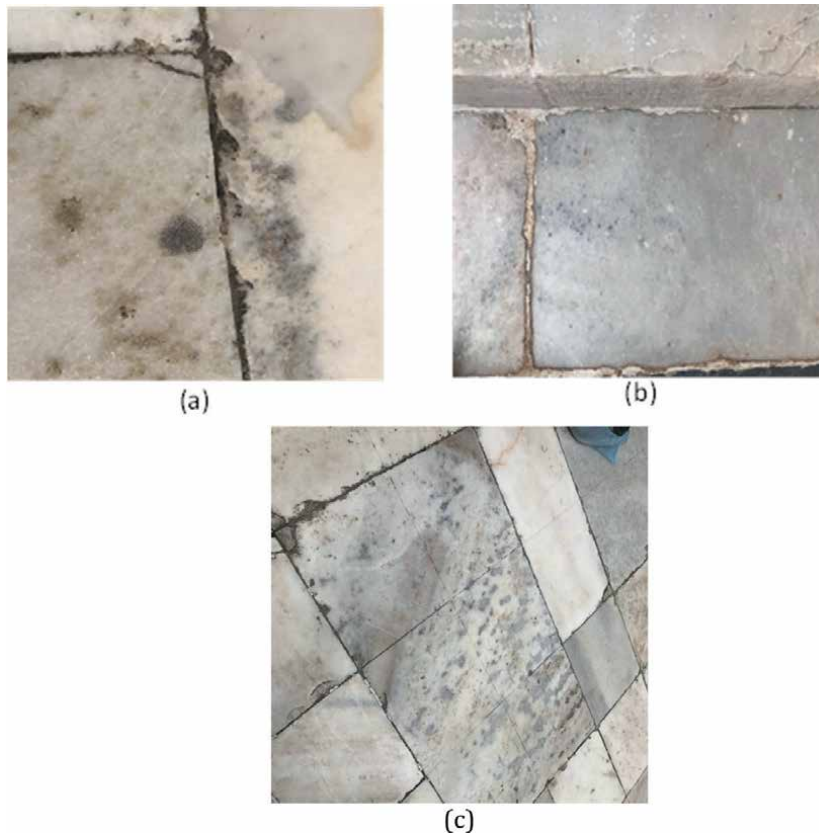

Figure 8.
(a) Greenish-black stains on the exterior floor slabs toward the Yamuna River of the Taj Mahal. (b) Bluish-black stain on the exterior floor of the Jaswant Thada. (c) Bluish-black stains on the exterior floor slabs of the Taj Mahal.

investigation by Agrawal [11], these spots were found to be the excrement of mosquitoes. It seemed that stagnant water along the riverbank provided an ideal breeding environment, leading to a proliferation of mosquitoes on the cool marble surface. Though no similar study was carried out for Jaswant Thada, similar spots were observed on the exterior floors of the main cenotaph, as shown in **Figure 8(b)**. As the climatic condition of the Jaswant Thada is similar to that of the Taj Mahal with a water body nearby, the cause of those spots can be similar to that of the Taj Mahal.

2.4 Vertical cracks

According to Agrawal [11], each marble slab is very heavy, weighing approximately 460 kg in the Taj Mahal, and placing one slab atop another subjects the lower ones to significant pressure, leading to the formation of cracks in the vertical slabs. Bowing of marble is another phenomenon seen in marble façades. Sousa & Sousa [12] cite causes for bowing as the intrinsic nature of calcite marbles and involves the anisotropic deformation of calcite crystals caused by thermal hysteresis (thermal expansion and contractions). This thermal hysteresis causes residual strain release with irreversible expansion of the stone matrix, which results in bowing of slabs.

Also, some hairline cracks were seen in the slabs on the exterior surface. They are often caused by temperature fluctuations or minor displacements in the stone. This observation is also supported by the laboratory experiments mentioned later in this chapter. **Figures 9–11** shows the different cracks seen in the Taj Mahal.

2.5 Severe pitting

Pitting phenomenon was significant in the exterior slabs of the structures, as seen in **Figure 12**. The expected causes were mainly chemical weathering, biological activity, salt crystallization, and abrasion. The formation of surface pits is evidently

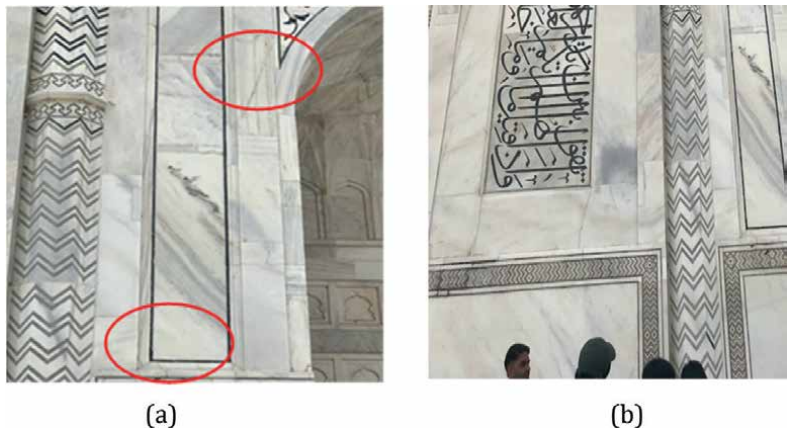

Figure 9.
(a) Diagonal cracks seen on the exterior slab of the Taj Mahal (b) Vertical cracks observed on the exterior of the main mausoleum of the Taj Mahal.

Figure 10.
Cracks observed on the intricately designed vertical marble slabs placed on the base (a platform for the main mausoleum of the Taj Mahal).

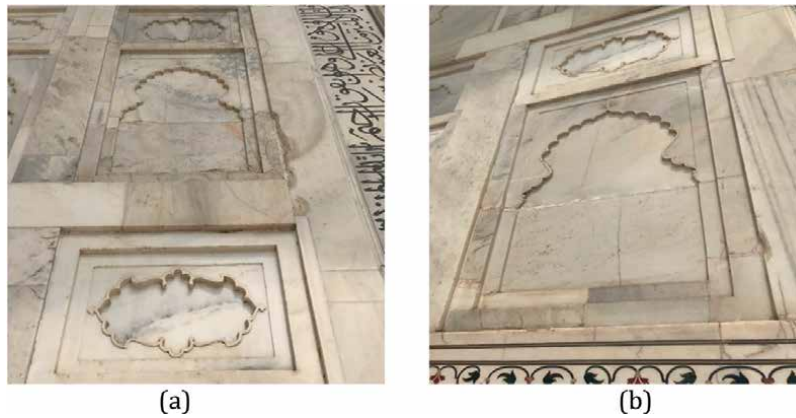

Figure 11.
(a) Different crack patterns on the exterior walls of the Taj Mahal) (b) Vertical crack patterns on the exterior walls of the Taj Mahal.

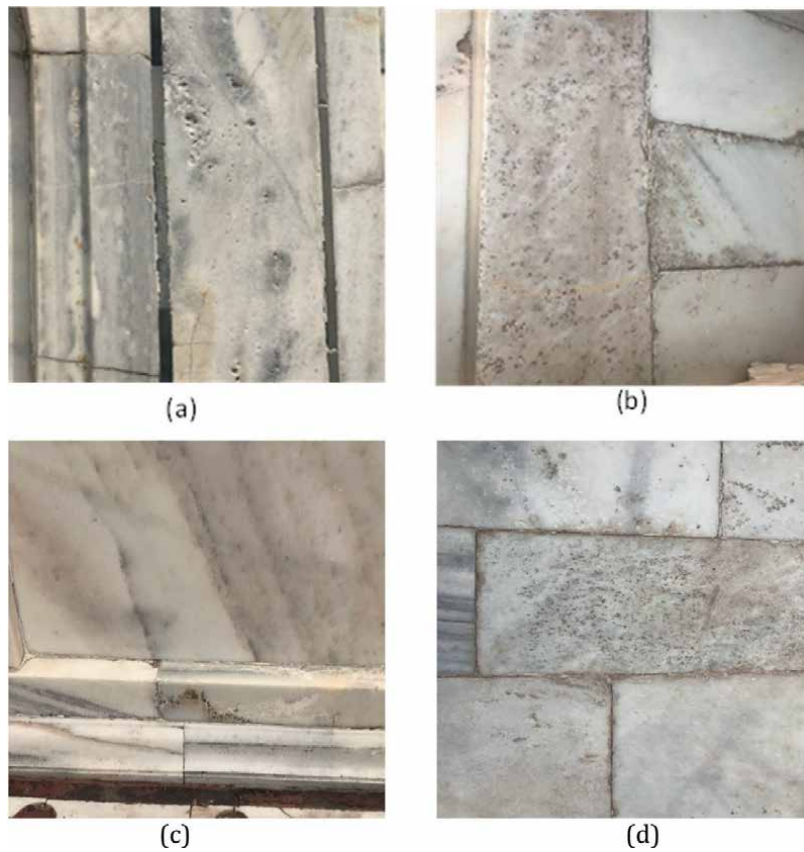

Figure 12.
(a) Sever pitting on the exterior surface of the Taj Mahal. (b) Severe pitting on the exterior surface of the Jaswant Thada. (c) Severe pitting on the exterior surface of the base platform of the Taj Mahal. (d) Severe pitting on the exterior surface of the base of the Jaswant Thada.

a result of the leaching out of marble minerals, accompanied by physical damage as rainwater affects the slab surface.

3. Thermal weathering at laboratory

From the site observation, it was evident that all the deterioration was caused by an increase in porosity of marbles on the structure. Though acid attack and salt weathering are weathering phenomena observed in the marble stone, the pathway for those weathering is created by expansion of pores. And this expansion is instigated by thermal differences in the stone. Hence, the thermal weathering has been identified as the major cause of degradation in the exposed marble surfaces in the given climatic condition. The study was extended to a laboratory investigation simulating similar thermal weathering in freshly obtained marbles, to understand the nature, pattern and extend of damages, which would validate the observation and assessment made at the site on inspecting the monuments. Thermal simulation at the laboratory level to understand the weathering mechanism was carried out following the literature by Boudani [13]. Marble cube samples were taken for the study sized 5 cm × 5 cm × 2.5 cm, three each per test. The laboratory temperature was maintained at 25°C. Samples were heated on the Hot Plate for 1 hour at 100°C and immediately cooled for 30 minutes by placing it on ice. The heating-cooling cycle continued for 200, 300, and 400°C.

The impact of the thermal weathering on the marble specimens was identified and measured by investigating their pore connectivity through the Karsten tube test for water absorption, material integrity through the ultrasonic pulse velocity (UPV) test, and visual observations.

3.1 Ultrasonic pulse velocity (UPV) test

Ultrasonic Pulse Velocity Test was carried out after 8, 12, 16, and 24 cycles of thermal weathering in the samples, and the results are shown in **Figure 13**. The initial

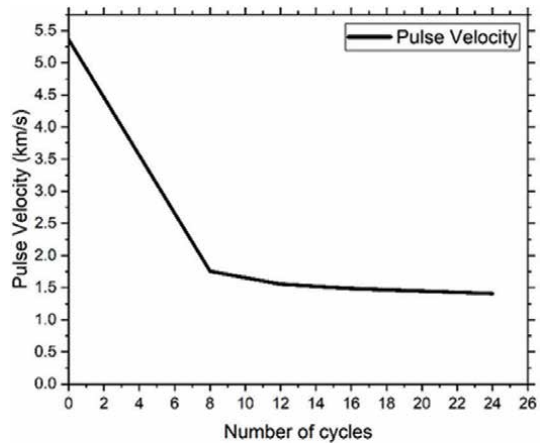

Figure 13.
UPV test results for thermally weathered samples.

phase of thermal weathering shows a high velocity, which declines significantly by the eighth cycle. This trend continues, with a reduced rate of decline in subsequent cycles, indicating that the marble was initially more homogeneous and less porous. However, as thermal weathering progresses, increased porosity, along with the development of microcracks and fissures, leads to a decrease in ultrasonic pulse velocity (UPV) values. This suggests that with the thermal variations, marbles become more susceptible to contamination and staining due to increased porosity and capillary action.

3.2 Karsten tube test

The Karsten tube test was conducted to assess the rate of water absorption in the specimens, providing insights into their open porosity. Initially, the test was performed on undeteriorated samples over a 4-hour period, during which no water absorption was observed in all three samples. However, after artificially deteriorating the samples, the test results, as shown in **Figure 14**, indicated a noticeable change in the water absorption rate. This suggests that initially, the pores were not interconnected, but after deterioration, both the number of pores and their connectivity increased.

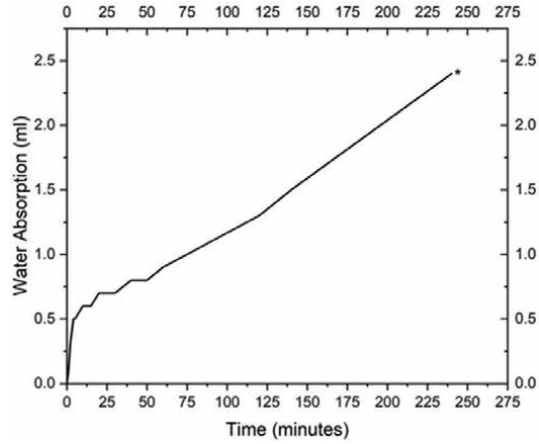

Figure 14.
Karsten tube results for thermally weathered samples.

3.3 Crack detection

A stereomicroscope study was conducted on three samples with no defects to detect surface cracks before and after artificial deterioration. After the 24th weathering cycles, hairline cracks appeared on all samples without following any specific pattern, as shown in **Figure 15**. This suggests that marbles are prone to cracking due to cyclic thermal changes, and similar hairline cracks were observed extensively in the monuments during visual inspection and survey, and it suggests that they may be attributed to this phenomenon.

Figure 15.
Hairline crack observed in the artificially aged sample.

4. Conclusions

The study of marble degradation in heritage structures reveals the complex interplay of intrinsic material properties and extrinsic environmental factors that contribute to the weathering of this historically significant stone. Despite its renowned durability, marble is not immune to the forces of nature and human influence. The deterioration of marble, as observed in iconic structures like the Taj Mahal and the Jaswant Thada, underscores the vulnerability of this material to thermal decay, soluble salts, and other environmental stressors.

The research highlights that while visual assessments are a critical first step in identifying damage, a comprehensive understanding of the degradation mechanisms requires a combination of observational data and advanced testing methods. By correlating the damage manifestations with their underlying causes, it is possible to develop more effective conservation strategies tailored to the specific conditions of each structure. From the assessment of the damages, it is inferred that thermal weathering is the major underlying cause for the manifestations observed, especially with the hot and semi-arid climatic condition in India.

In the last part, the study simulates thermal weathering in laboratory on fresh marble samples to understand the extent of thermal weathering cycles on Makrana Marble stones. Significant degradation was observed in terms of mass loss, ultrasonic pulse velocity decrements, and formation of new hairline cracks and fissures. Continued research in this field is essential for advancing conservation practices that can mitigate the impact of weathering and ensure the longevity of these cultural treasures for future generations.

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Conflict of interest

The authors declare no conflict of interest.

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Chapter 5

The Heritage Destruction of Manila: Cultivating a Heritage-Driven Economy for the City of Manila

Geoffrey Rhoel C. Cruz

Abstract

Over the years, cities across the world have experienced unprecedented growth and development, imposing greater demands on states and cities alike, resulting in the unsustainable use of finite resources. Such growth has been associated with high levels of environmental damage and social dislocation; hence affecting cities' competitiveness, efficiency and livability, and overall sustainability. The City of Manila, Philippines, is not an exception. The tension between heritage and development stems from a lack of awareness on the part of the stakeholders. For most, cultural heritage, tangible or intangible, is just an ordinary concept that nostalgic people still adhere to. Others see heritage as a hindrance to development, as the old dichotomy of heritage and development provides such that the usual practice is for cultural heritage to give way to the principles of development, leading to the destruction of built cultural heritage. This chapter presents how heritage can work side-by-side with development, with culture and heritage serving as an integral part of the city's economic backbone. A heritage-driven economy framework can be an effective means to promote a creative economy that can generate employment opportunities and improve the existing economic conditions of the city.

Keywords: heritage conservation, heritage-driven economy, cultural heritage, heritage tourism, heritage destruction, sustainable city

1. Introduction

Over the years, cities across the world have experienced unprecedented growth and development, imposing greater demands on states and cities alike, resulting in the unsustainable use of finite resources. Such growth has been associated with high levels of environmental damage and social dislocation; hence affecting cities' competitiveness, efficiency and livability, and overall sustainability. Accordingly, sustainable cities are places that are planned and managed in consideration of the three pillars of sustainability namely: social, economic, and environmental impact, without compromising the ability of future generations to experience the same [1].

In the Philippines, Manila serves as the city center comprised of 897 barangays grouped in 100 zones and 16 administrative districts and clustered into six congressional districts [2]. The city was founded by the Spanish Governor General Miguel Lopez de Legazpi on June 24, 1571, after befriending the early leaders of the town in a historical feat. In 1574, King Philip II of Spain granted Manila the title "Noble and Ever Loyal City," thus fortifying Manila as the seat and power of the Spanish forces in the Spanish East Indies which includes the Philippines, Palau, Guam, and the Marianas. It was declared as the first chartered City in the Philippines in 1901 and was vested with an autonomy status in 1949.

Every city has a story to tell and the City of Manila is no exception. Being one of the oldest cities in the world established in 1571, Manila was able to compile numerous stories that eventually comprised and composed the city's character, nature, and soul. Carmen Guerrero Nakpil once described Manila's colonial experience as like staying for 300 years in a convent and 50 years in Hollywood, and we can even add 3 years of eating sushi and 50 years of "his and hers" to account for the five decades of Manila's post-colonial experience, making Manila and Philippines as everybody's colony. Moreover, Manila was noted to have around 100,000 inhabitants comprised of Spaniards, mestizos, native-born Filipinos, Chinese, Armenians, English, French, and other nationalities. De Zuñiga [3] even considered that there are hardly any type of people in the world who would not have some individual representatives in Manila [4].

During the Spanish colonization of the Philippines, Manila was commensurate to Intramuros, one of its popular districts today. The *Intramuros* was established to serve as a political and military base for the Spaniards in Asia due to its strategic location between Manila Bay and the Pasig River. Intramuros followed the traditional town-plaza community set up commonly practiced during the Spanish colonization, and it has been the hub of the famous galleon trade as well. It was established to house Spanish officials and delegates including their families, the reason for it to be designated as a Spanish-only zone. Such explains the reason for the six-meter-high walls three kilometers in length that cover 160 hectares area, which were fortified with cannons and moats to protect it from possible invasions. The entry and exit points were controlled through seven fortified gates and drawbridges that kept the Spanish hospital, government offices, churches and schools, military barracks, and residences of the Spaniards safe and secluded. Only horse-drawn carts can pass through the drawbridges leading to the numerous gates of the compound during that time, as defensive features surrounded the thick walls hence standing by its name of "city within the walls." Locals had to walk on foot, which was most of the time barefooted.

Moreover, non-Spaniards such as the Chinese and Filipinos had to settle at the outskirts of Intramuros in the districts of San Miguel, Sta. Ana and Binondo are known as *extramuros* or outside the walls. Those who are working in Intramuros by the day would have to leave by the night before the gate closes.

Certainly, Manila has a very rich story to tell. Dr. Eric Zerrudo of the University of Santo Tomas Center for Conservation of Cultural Property and Environment in the Tropics (UST CCCPET) in an interview with the researcher stated that "*pag may kwento, may kwenta; pag may kwenta, may kita*" (personal communication, 7 May 2021). Such applies perfectly to the case of the City of Manila. Heritage advocate Mr. Ivan Man Dy (personal communication, 10 May 2021) of Old Manila Walks, a popular heritage advocate and ICOMOS Philippines member, even tagged Manila as the historic capital of the Philippines, having the longest tenure of being the country's capital and comprising about 80% of Philippine tourism guidebooks. Dy even

branded Manila as the heart and soul of the country being the common entry and exit points for arriving and departing tourists which coincides with the pronouncements of USTCCCPET Director Dr. Zerrudo (personal communication, 7 May 2021) and tour operator Mr. Dustin Ancheta (personal communication, 18 May 2021) of the Manila for a Day tour group. Mr. Mark Evidente (personal communication, 4 August 2021), a heritage advocate, lawyer, and environmental planner, reiterated that Manila is indeed a basket of historical wealth.

Nevertheless, Manila has been the home of many firsts in the Philippines such as the first schools/universities, hospitals, government offices, financial institutions and banks, lighthouse towers, hotels, train systems, and other many indications of urban living. But in the aftermath of colonization and after a series of battles and wars, the district lost its original value and significance. The fortifications suffered heavily during the liberation wars from various foreign colonizers, in addition to natural catastrophes of fire, earthquake, and typhoons that gave the city a true test of time. Gradually, the city began to lose its competitive edge as adjacent cities started to initiate development initiatives on their own to lure former constituents of Manila to relocate to more profitable, livable, and environmentally sound neighborhood cities thus leaving the City of Manila lagging. Most businesses found it practical to move to different business hubs rather than reconstruct or establish their business after it was destroyed by the war, in addition to the decreasing quality of life in the area.

Indeed, Manila underwent the accelerated process of development as the principle of modernization, which adheres to the linear path of development involving a transition to industrialization from a generally agricultural industry through the spread of market relations and the process of technical diffusion [5], has taken its toll over the city. As the city moved toward urban development, it was accompanied by a high demand for structural improvements such as skyscraper buildings and modern facilities. Demands for additional social infrastructures such as housing facilities and commercial complexes were on the rise as well to complement the rapid increase in urban population. Most often, with poor urban planning and the absence of zoning regulations, actions to such demands were at the expense of heritage conservation. Besides, the scarcity of available spaces has led to the displacement of built heritage structures of historical parks and monuments and even ancestral houses. Skyscrapers of shopping malls, theme parks, residential condominiums, and commercial centers that physically or visually impair the original build and design of such cultural treasures, serve as their usual substitutes. Such has affected the overall sustainability of the City of Manila.

In 2022, Arcadis Design and Consultancy (Arcadis), a global company dedicated to improving the quality of life published the results of the 3rd Sustainable Cities Index (SCI). The index explores the citizen perspective of city sustainability patterned after the beliefs of Arcadis global cities director, John Batten, suggesting that "cities are powerful engines that bring people together and allow for resource sharing to meet collective needs." Such has been the mantra of the company as inspired by the three pillars of the Sustainable Development Goals.

In 2015, "leaving no one behind" became a popular motto as the United Nations (UN) adopted Sustainable Development Goals (SDGs) with 17 goals and 169 targets. The SDGs were an offshoot of the Millennium Development Goals (MDGs), which drew flak for being not ambitious enough as manifested in the absence of the interrelatedness of the development objectives as they were usually presented as stand-alone objectives as shortcomings were observed on Goal 8 in particular, which stipulates the need to "develop a global partnership for development." With the new set of global

goals identified in the SDGs, it envisions a holistic approach to achieving sustainable development for all.

The SDGs were anchored on the principle of sustainability as defined by the Brundtland Report [6] as "a process aimed at achieving environmental and social improvement, both locally and globally, or a state that can be maintained at a certain level indefinitely." Since then, sustainability has been considered as "meeting the needs of the present without compromising the ability of future generations to meet their own needs."

The 17 SDGs call for a framework patterned on three interdependent aspects: (1) environmental protection; (2) economic growth; and (3) social development. Holmberg and Tickell [7] extensively discussed that a sustainable environmental system is necessary in which renewable resources are given primacy and avoid exploitation and over-use of non-renewable resources. Moreover, a sustainable economic system is also important in which safeguards are effectively installed that guarantee the continuous production of goods and resources while providing an inclusive development for all that ensures the equal provision of adequate social services.

In relation to the SDGs, Arcadis measured the sustainability of cities using three indices patterned after the three pillars of the SDGs categorized as people, planet, and profit as shown in **Figure 1**. The three indices are connected to the SDG commitments of the United Nations covering the aspects of "health and well-being; water and sanitation; industry, innovation and infrastructure; inclusive, safe, resilient and sustainable cities; climate change impacts; life on land; and partnership."

In the latest SCI, the Norwegian City of Oslo tops the overall list. However, the City of Manila in the Philippines was ranked 93rd overall out of 100 countries surveyed, two notches better than its 2018 performance. The City of Manila was indexed at 97th for people (93rd in 2018), 83rd for the planet (91st in 2018), and 89th (98th in 2018) under the profit category. As a UN member country, the Philippines continuously manifests its commitment to achieving the targets set by the SGDs. However, most of the country's action plans were focused on empowering people and ensuring inclusiveness and equality as reported in the Philippines' Second Voluntary National Review [8]. Lesser attention was given to inclusive economic and social development, a major issue for most least-developed countries, particularly in Asia.

As developing countries follow the linear pattern of development, modernization has likewise contributed to the development of urban decay thus compromising cultural heritage. As such, Target 11.4 of the SDGs specifically calls for its protection and

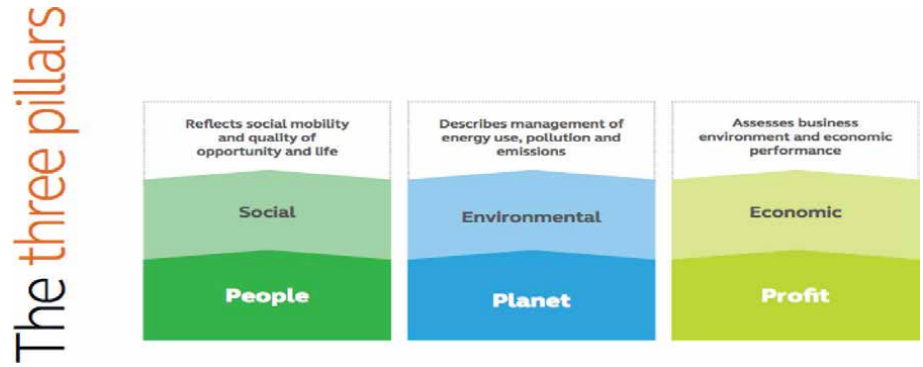

Figure 1.
The three pillars of the sustainable cities index. Source: Arcadis [1].

preservation hereby making cities and human settlements inclusive, safe, resilient, and sustainable

Target 11.4

"Strengthen efforts to protect and safeguard the world's cultural and natural heritage."

National government		
Name of organization	**Methodology**	**Key informant**
1. Intramuros Administration	Zoom Online Interview	Mr. John "Rancho" Arcilla
2. Department of Tourism	Survey Questionnaire	Ms. Catherine C. Agustin
3. National Commission for Culture and the Arts	Survey Questionnaire	Mr. Lawrence Charles E. Salazar
4. National Historical Commission of the Philippines	Zoom Online Interview	Arch. Ma. Luisa Valerio
Local government		
5. City of Manila, Department of Tourism, Culture and Arts of Manila	Zoom Online Interview	Mr. Ronald Flores
Non-governmental organizations, community-based organizations, heritage advocates		
6. Heritage Conservation Society	Zoom Online Interview	Mr. Gio Abcede
7. HUB Make Lab	Survey Questionnaire	Mr. Roberto Sylianteng
8. UST Center for Conservation of Cultural Property and Environment in the Tropics	Zoom Online Interview	Dr. Eric Zerrudo
9. Santa Ana Heritage Tours	Zoom Online Interview	Mr. Boyet Magale
10. ICOMOS International	Zoom Online Interview	Dr. Ivan Anthony S. Henares
11. Ateneo De Manila University, Institute of Philippine Culture	Zoom Online Interview	Dr. Fernando Nakpil Zialcita
12. Old Manila Walks	Zoom Online Interview	Mr. Ivan Man Dy
13. San Sebastian Basilica Conservation and Development Foundation, Inc.	Zoom Online Interview	Ms. Marianne Claire Vitug
Private organizations and business groups		
14. Philippine Postal Heritage Walking Tour	Survey Questionnaire	Mr. Lawrence Chan
15. Meaningful Travels	Zoom Online Interview	Mr. Jerome Carolino
16. Manila for a Day	Zoom Online Interview	Mr. Dustin Ancheta

Table 1.
List of key informant interviews [13–15].

Like Ebbe [9], Joan Henderson [10] foretells serious environmental and social problems of urban development brought by the undying ambition of cities to be international financial hubs and business centers. Hence any semblance of the reluctant past is deemed as a manifestation of unproductivity and underutilization of scarce resources and thus needs to be removed to advance forward. Francesca Nocca [11] cited that the continuous pattern of build and destroy appears incompatible with the principles of sustainable development "as progress in one area can produce negative implications to another," as resources are finite and tend to be consumed at the expense of future generations and have significant "environmental, economic and social well-being" implications. Thus, Katrinka Ebbe [9] has deemed rapid urban expansion as a significant risk to such irreplaceable cultural resources. In fact, according to the United Nations, global threats to cultural heritage increased notably in the last 20 years [12].

This chapter provides a descriptive analysis of cultural heritage destruction in the City of Manila, Philippines. Through a semi-structured online key informant interview, this chapter presents a qualitative study on how a heritage-driven economy can alter the existing political landscape in the City of Manila in terms of cultural heritage conservation.

Table 1 summarizes the list of key informant interviews.

After the key stakeholders were identified and the key informant interview process was completed, stakeholders' objectives and interests were extracted from the data that set their respective focus. The chapter looked into the stakeholders using a stakeholder analysis to find out if there is a power struggle among them. The chapter likewise assessed the stakeholders' possible areas of motivation to reflect their respective expectations. Moreover, a stakeholder attribute identification was also conducted based on the interviews and available secondary data as guided by the principles of stakeholders' engagement by Wang et al. [16] and Góral [17] in assessing the participation level of each stakeholder in the formulation of an effective cultural heritage-based tourism program for the City of Manila.

A comparative analysis of the collected responses was done to categorize the perspectives of the different stakeholders and identify the possible source of the perceived tension between cultural heritage conservation and tourism development. Moreover, the chapter's findings and recommendations were based on the opinions provided by the respondents, speaking mostly in their capacity and not on behalf of the organization that they represent.

2. The heritage destruction of Manila

The City of Manila is no stranger to urban decay. Numerous ancestral houses and heritage sites were converted to high-rise commercial complexes, while some ended up being adapted as local warehouses. There are also cases of heritage structures abruptly being demolished if not left out to deteriorate. The Metropolitan Theater (MET) in Manila is a classic working example, used to serve as a hub for international performances but was suddenly abandoned until the National Commission for the Culture and Arts (NCCA) decided to acquire it in 2015 for rehabilitation. The same is the case of the Rizal Monument in Luneta, Manila when it became controversial in 2014 following the construction of a 46-story residential building blighting the sightline of the monument of the Philippine national hero. The pre-World War II structure of the Rizal Memorial Sports Complex was almost demolished in 2018 to

be converted to a mixed-use commercial establishment after a business conglomerate offered to refurbish the complex. The Sta. Cruz Building built in 1948 in Escolta, Manila likewise was almost demolished in June 2019 if not for the saving grace done by the National Historical Commission of the Philippines (NHCP) in issuing a cease-and-desist order to stop its demolition.

However, the famed Angela Apartments in Malate, Manila, the Admiral Hotel in Roxas Boulevard, Manila, the Philippine Free Press building in Quiapo, Manila, the Jai Alai building in Taft Avenue, Manila, the Philbanking Building near the Anda Circle, Port Area Manila, the Avenue Theater in Avenida, Manila, the Carlos Palanca Mansion in Taft Avenue, Manila, the old Meralco Head Office in San Marcelino, Manila, and the Yuchengco House in San Nicolas, Manila were all gone in what was tagged as the *Heritage Rape in Manila*.

Heritage buildings in Calle de la Escolta, in the City of Manila, were likewise deemed as casualties of heritage destruction. Heritage architectures in the area were being demolished one after another to be reconstructed as modern edifices to serve new functions and purposes. To begin with, the 1914-dated structure of the El Hogar Filipino Building was acquired by a group of Filipino-Chinese real estate developers who intend to demolish the structure to reconstruct as a modern condominium. The old 1962 Philippine National Bank Building (PNB) was the next to follow when the local government of Manila ordered its demolition in 2016 after being deemed as unsafe following a fire incident in 2015. Another casualty is the old Capitol Theater which commenced with the demolition in 2018 to give way to a high-rise structure while maintaining the façade of the old structure. The latest casualty is the Sanchez House on Bilibid Viejo Street in Quiapo, Manila, a presumed ancestral house of over 50 years of age, which was given a demolition permit by the City of Manila in 2019. In 2021, the recently proposed Pasig River Expressway has threatened the stability of numerous heritage sites along its corridor, in addition to the ecological threats to the Pasig River hence affecting its sustainability.

A list enumerating the reported cultural heritage casualties over the last four administrations of the City of Manila shows that most of the heritage destructions took place during the administration of former Mayor Joseph Estrada (2013–2019) were 15 out of 19 built cultural heritage sites were either reportedly demolished in full or partially. Second to the list was former Mayor Lito Atienza (1998–2007) with three reported heritage casualties during his stint. Nevertheless, the study was not able to track any reported built cultural heritage destruction during the term of former Mayor Alfredo Lim (2007–2013), while the administration of Mayor Isko Moreno (2019–2022) has one reported built cultural heritage casualty. So far, none has been recorded for the current administration of Mayor Maria "Honey" Lacuna.

Table 2 summarizes the findings.

Among the mentioned heritage casualties, the demolition of the Jai Alai building became the triggering point for cultural heritage activism to gain ground resulting in the passage of the National Cultural Heritage Act in 2009. The controversy stemmed from the executive order issued by the then-local chief executive, Lito Atienza, in 2000 to demolish the Jai Alai building to give way to the construction of the new Hall of Justice of the City of Manila. Furthermore, the mayor also pronounced that the building is a mere reflection of a gambling culture and thus should be removed, without consideration of its cultural heritage value. Nevertheless, the construction did not push through as there were reports that the new Hall of Justice would be constructed at the present location of the old GSIS building near the Manila City Hall instead which is another structure with presumed cultural heritage importance.

Built cultural heritage	Est. year of demolition/destruction	Administration
Admiral Hotel	2014	Estrada
American Chamber of Commerce (Lusco Building)	2017	Estrada
Angela Apartments	2019	Estrada
Avenue Theater	2006	Atienza
Carlos Palanca Mansion	2016	Estrada
Hospicio de San Jose Accessoria	2017	Estrada
Jai Alai Building	2000	Atienza
Life Theater (Villonco Building)	2018	Estrada
Old Capitol Theater	2018	Estrada
Old Meralco Head Office	2013	Estrada
Old PNB Building in Escolta	2016	Estrada
Philbanking Building	2018	Estrada
Philippine Free Press Building	2019	Estrada
Philippine Su Kuang Institute	2017	Estrada
Sanchez House	2019	Moreno
Sta. Cruz Building in Escolta	2019	Estrada
Uy Su Bin Building	2019	Estrada
Yuchengco House	2017	Estrada

Table 2.
List of built cultural heritage casualties over the last five administrations of the city of Manila.

The changing cultural perspectives of the different local government administrations of the City of Manila is a reflection of the leadership priorities given consideration by the elected local chief executive. Former Mayor Lito Atienza was known for his urban development governance principles originating from his beautification programs for the City of Manila. When former Mayor Alfredo Lim took office, the mayor shifted to law and order as his top concern. Afterward, former Mayor Joseph Estrada adopted a "champion of the poor" stance of governance with the promise of providing employment opportunities to the residents of the city while addressing the financial deficit left by the former administration. Then, Mayor Isko Moreno promised to raise the bar of governance in the City of Manila by promising an overall improved quality of life to the residents of Manila through social amelioration programs that offer a combination of pension for senior citizens, student allowance, and nutrition assistance for children in an attempt to combat poverty. Lastly, current Mayor Maria Sheilah "Honey" Lacuna capitalizes on the health and welfare of the people initiatives as the focal point of her governance. However, among the five local chief executives, it was only Mayor Isko Moreno who was vocal about his plans involving cultural heritage conservation.

3. The heritage and tourism hubs of Manila

To save what is left of the rich heritage of Manila, a sustainable pattern of production and consumption needs to be considered. Nocca [11] recommended that the

principles of the circular economy be adapted instead to achieving sustainable development in which "negative impacts are minimized while producing environmental, economic, and socio-cultural benefits." Instead of pushing for the generation of new resources and structures, the relationship between conservation and sustainability needs to be explored. It was also mentioned by Nocca that, "culture serves as a key element in the humanization of cities and human settlements," such that "the role of cultural heritage in developing vibrant, sustainable and inclusive economies, and in sustaining and supporting urban economies to progressive transition toward higher productivity" has been acknowledged to a great extent hence emphasizing the need for cultural heritage preservation.

Considering such historic-cultural wealth, the local government of Manila initiated the Manila Tourism and Cultural Development Plan 2020–2025 which envisions the city to become a "world-class capital city of rich heritage, distinct character and diverse Huns of knowledge with its capable and committed people putting God first in forging partnerships to harness these urban assets for green, resilient, inclusive, smart and sustainable development, linking the nation to the world and inspiring the hopes of the Filipino people." The development plan was anchored on capacity-building and infrastructure programs based on "what do you have, where do you want to go, what do you do?."

The plan identified eight tourism hubs with distinct characters, each comprised of two district groups based on proximity and homogeneity accommodating all sixteen districts of the City of Manila.

3.1 Intramuros and port area

Manila's cultural heritage is bannered by the district of Intramuros which is maintained and supervised by the Intramuros Administration, serving as the prime agency of the national government that deals with matters involving Intramuros. It handles most of the affairs in the area composed of five barangays with an estimated population of 8000 residents.

Intramuros once served as the capital of the Spanish occupation during the sixteenth century. It was originally built to serve as the residence of Spanish government officials and their families. It was once where the most influential, prominent, and wealthy citizens of Manila lived such that Chinese and *Indios* (Filipino natives) were not allowed to stay inside Intramuros permanently, which was designated as a Spanish elite and Spanish Mestizos-only zone. It has been the heart and soul of the City of Manila, but in the aftermath of colonization and after a series of battles and wars, the district lost its original value and significance. Nevertheless, it is the reason why the more the district deserves to be conserved and promoted such that it contains "bittersweet memories of the colonial past, a heritage deemed worth preserving and conserving for the future generations" [18].

Intramuros' heritage is mostly a resemblance of the Spanish way of life and architecture with Intramuros being branded as Spaniard only zone, therefore, housing pertinent Spanish structures and architectures like churches, government buildings, plazas, schools, and houses of Spaniards usually made from bricks and woods.

The district boasts the collection of its remaining Spanish *antillian* houses or *bahay na bato*, as well as what remains from the original seven churches that were constructed by different religious orders during the Spanish reign in the region such as the Manila Cathedral and the San Agustin Church together with the schools that they administer. Presently, most of these Catholic schools either moved out of the

confines of the walls of Intramuros or were destroyed by the heavy bombings during World War II.

At present, it has been inhabited mostly by urban dwellers living in shanties and shacks standing side-by-side with numerous commercial complexes and several government offices. With minimal formal residential communities, most of the people in the area can are active during daylight as Intramuros houses the Intramuros Consortium of four higher education institutions that includes Colegio de San Juan de Letran, Lyceum of the Philippines, Mapua University, and the *Pamantasan ng Lungsod ng Maynila*, therefore only a few students are living in the area and most were leaving during night time. Thus, what used to be a "No *Indio* Zone" of 64 hectares compound with 4.5 m of graying stonewalls became almost a ghost town at night and had become the sanctuary of informal settlers thus compromising the area's sustainability.

Moreover, Intramuros' regulated urban land use has provided the area with numerous open spaces and public parks which presently serve as its prime attractions which include Fort Santiago, Casa Manila, and Baluarte de San Diego. Such attractions contribute to revenues generated by other Museums located inside Intramuros like the Museo de Intramuros, Bonsai Library and Museum, Light and Sound Museum, the Bahay Tsinoy, San Agustin Museum, Silahis Center and the Destileria Limtuaco Museum. Aside from Museums, open space venues for meetings, events, and conferences are added attractions that can be found inside Intramuros.

Recent developments in Intramuros focus on trying to rehabilitate the area by luring back commercial activities just like the old times. It has been dubbed "Manila's next creative hub." The Intramuros Administration along with the Creative Economy Council of the Philippines hopes to rehabilitate the walls of Intramuros one wall at a time, tagging it "Bring the Walls Down." The first to undergo an urban facelift is the Maestranza Wall which is being converted into a modern creative hub called "Maestranza Creative Quarter." The area served as the location for the infamous "galleon trade" during the Spanish trading heydays. The modern hub follows the concept of adaptive reuse and is designed to house 44 chambers to be used for artist studios, exhibition halls, incubation spaces, and workshop areas [18].

More than that, the old customs house in Intramuros is one step closer to revival as plans to reconstruct the abandoned Aduana have received support from the local government and the Department of Public Works and Highways. The Aduana, also known as the *Intendencia*, is being eyed as the new home of the National Archives of the Philippines after its former location in Binondo was hit by fire in 2018.

Likewise, the reconstruction of the old San Ignacio Church in Intramuros was finally finished and was opened to the public last May 2019. The original San Ignacio Church was heavily damaged during the Battle of Manila in 1945 after it was left burning for four days thus leaving it abandoned for almost four decades as the local community turned the space into a community basketball court. The old church is now the house of Museo de Intramuros which houses about 500 religious artifacts found in old churches within the area [19].

3.2 Binondo-San Nicolas Chinatown

Apart from Intramuros, Manila's heritage tourism also consists of the district Binondo. During Manila's heyday, no one can speak of trading without mentioning the district of Binondo for it served as the country's trading port during the popularity of the Manila-Acapulco galleon trade which linked four continents including Africa, Asia, the Americas, and Europe. During that time, Manila served as the

gateway to Asia as it controlled items coming to Asia for export to Europe and vice-versa which included but was not limited to silk, porcelain, embroideries, linen, and textiles from India, stones and pieces of jewelry from China, spices from Moluccas, even carpets from Persia, thus making Manila as the foremost city of the Eastern Indies [4, 20]. More than that, Manila was even considered the world's first global city (Irving in [4]).

With Intramuros being an exclusive zone for Spaniards but still recognizing the significance of the Chinese merchants particularly in the Galleon Trade, the Chinese traders and merchants were housed in an area just outside Intramuros called Parian de Arroceros which form part of the district of Binondo today accessible through one of the Intramuros' gates. From being a simple Chinese settlement, it grew to become the commercial center of Manila. After being consistently relocated it found its final home in Binondo which is known today as Chinatown after serving as the business district of Manila due to its proximity to Intramuros and the Pasig River which then was the primary highway.

The district of Binondo is known today as the oldest Chinatown in the world, a popular haven for Chinese cuisine and merchandise as local Chinese traders decided to settle in the area permanently. As a Chinese community, Chinese Buddhist temples are also among the attractions in the area apart from family clan temples that are mostly situated on the top floor of the buildings. Binondo is also the home of the Minor Basilica of San Lorenzo Ruiz which was built in 1596 to serve the spiritual needs of the Filipino-Chinese or *tsinoys* in the area. The church was destroyed during World War II but was then reconstructed maintaining the façade and the original belfry. The Insular Life Building constructed in 1930 is among the listed heritage buildings in the area.

The Spaniards first established the district in 1594 to facilitate the conversion of Chinese immigrants to the Catholic faith as the area was close to the capital of the city, which was the center of the Catholic faith during the Spanish time. Aside from the presence of the Chinese community, Binondo was known for a lot of firsts for the City of Manila such as the first department store, theaters, and pharmacy. It is also among the train stops of the main mode of transportation in Manila, the *tranvia*.

Different nationalities opened their offices and shops in Binondo which became the preferred place of work and home address of almost everyone. Binondo became the central business district of Manila housing a large number of banks, private companies, and commercial complexes. Moreover, Binondo's glory days lasted until the 1970s when industrialization called for sudden urbanization thus bringing with it the various complexities of an urbanized town like traffic congestion and accessibility issues to name a few that lured away most prime businesses together with the upper-income residents that go with it to developing places like the Ayala Avenue of Makati which was a former grassland and the Ortigas Center in Pasig.

Furthermore, what remains in Binondo are descendants of the original Chinese ancestors that continue to run their small to medium enterprises enjoying the proximity to the South harbor as the primary channel for transporting goods for import and export. Nevertheless, several old edifices used during the reign of Binondo as the commercial capital of Manila still stand today, mostly buildings and ancestral houses usually characterized by being along *esteros* connected to the Pasig River, however, such structures were either abandoned or had smaller number of tenants with lower rental rates, very far from its original glory.

Now, the Binondo China Town area is getting popular for its culinary heritage which still showcases authentic Chinese recipes mixed with contemporary popular

Chinese dishes as it is among the common destinations of walking tours by food enthusiasts (I. Dy, personal communication, 10 May 2021).

Adjacent to the district of Binondo is the district of San Nicolas, separated by the Pasig River. If Binondo is a busy district for being the commercial district of Manila during its prime days, San Nicolas is known for a being quiet and charming town significant for the various roles it portrayed for the City of Manila more than being just an accessory to the popular district of Binondo. Most of the residents in the area were of Chinese descent prompted by the freedom given to them to move freely outside the confines of the Parian or elsewhere within the archipelago. With the newfound freedom, most Chinese merchants decided not to move far away from the area and thus decided to settle in the nearby town of San Nicolas. Today, San Nicolas boasts a wide collection of heritage houses: both stone, and wood and thatch houses comparable to the heritage houses in Silay, Bacolod, and Vigan, Ilocos Sur. San Nicolas offers what Intramuros does not have, namely authentic heritage houses [20]. As Dr. Fernando Zialcita [4] recounts:

> *"excellent examples of Filipino urban house style of the nineteenth and early twentieth centuries can be found in the district, most remain elegant and splendid, though in a ruinous state."*

Apart from being the extension of the Filipino-Chinese community, San Nicolas was also once an important industrial center as most foundries in Manila were established in the area in addition to being the center of the scent-making industry as represented by the scent-names born by various alleys and streets in the area [20].

San Nicolas also became the setting of the Galleon Trade; it became the holding area of goods participating in the Galleon Trade pending customs clearance as the first local customs house was constructed in San Nicolas as well as the first lighthouse in the country which validates its proximity to the point of entry of the Pasig River.

More than that, San Nicolas played a significant role in the cultivation of Philippine nationalism, branded as the cradle of the Philippine Revolution [4]. It is in the area where Andres Bonifacio convened a meeting to establish a revolutionary organization, the *Katipunan*, aspiring to overthrow the Spaniards through armed struggle. Additionally, Katipunan's publication, the *Kalayaan*, was drafted in one of the houses present in San Nicolas.

3.3 Quiapo and San Miguel

Quiapo is one of the popular districts in Manila, known for its thrift shops and bazaars selling almost everything on a bargain including traditional crafts and even herbal medicines and other medicinal concoctions. Above all, what makes Quiapo popular nowadays is due to it is the center of the devotion of two of the country's primary religions, Christianity and Islam. It is where two different cultures and beliefs meet. For the Catholics, Quiapo houses the Minor Basilica of the Black Nazarene locally known as *Señor Nazareno*, at the same time it features the biggest mosque in Manila, the Manila Golden Mosque and Cultural Center, for the Muslims. On top of that, Quiapo showcases Japanese-related icons such as carp, turtles, and a dragon on a separate street. But for Zialcita [21],

> *"Quiapo district in the City of Manila is more than the Nazarene and Quezon Boulevard. It has excelled in painting, music, cooking and the arts. It harbors*

> *landmarks that are unique in the world. It also has neighborhoods in charming 1900s settings."*

At one time, Quiapo was considered the center of the City of Manila for it is geographically located at the heart of the city. It is convenient accessibility to the City of Manila's government center, commerce and financial district, and religious pilgrimage provided greater leverage for the people to stay in the area, in addition to the point that modes of transportation present during that time were both by land and water which provided greater value to properties lying beside the *esteros* (**Figure 2**).

As such, Quiapo has a good collection of old mansions and ancestral houses that became the abode of prominent personalities and families of Philippine politics and culture making it a higher-class residential district. In addition, colleges and universities were established in the area during the American era together with other social and business establishments including cinema houses, theaters, and restaurants.

Nonetheless, Quiapo played a key part in the formation of Philippine nationalism, historically and presently. Just like today, Quiapo has been a key site for political actions and resistance movements, with Plaza Miranda as the center thus proclaiming the area as a symbol of the Filipino's political conscience [22]. The Bahay Nakpil-Bautista was once the residence of a former member of La Liga Filipina and the Katipunan.

However, social and economic changes brought obsolescence to the area. Since major streets in the area are mostly narrow and suited only for light vehicular traffic just like any old district in the world, the district failed to cope up with the rapid increase in population. The increased demand for urban space for having an excellent location for commercial and office buildings has been a real threat to Quiapo's heritage houses. This makes the destruction of heritage houses or conversion to commercial complexes more attractive than its preservation, for the prior provides bigger economic returns over a short time while the latter requires circular economic development to generate attractive economic returns [23].

As the demands of modern-day lifestyle continue to mount pressure on the old and already fixed infrastructures of Quiapo, the district gradually lost its competitive edge over nearby districts and cities thus prompting commercial and financial centers

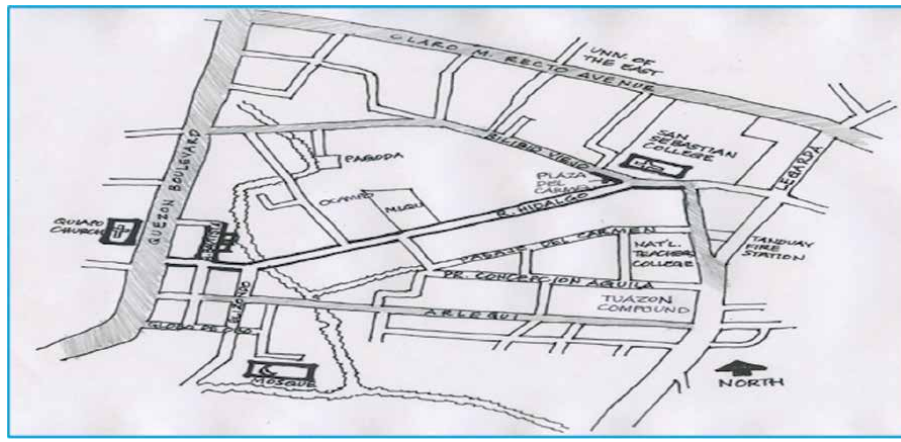

Figure 2.
The map of Quiapo, illustration by Roz Li of Quiapo history project. Available from: https://www.facebook.com/114030176708539/photos/a.114038570041033/114038540041036/?type=3&theater.

to move to the modern business districts of Ortigas and Makati that showcases better urban planning. What was left in Quiapo nowadays are low-income retail establishments as obsolescence resulted in gentrification as old residents started to move to other parts of the city, although there are still few old residents staying in the area. What attracts people today in Quiapo is the proliferation of thrift bargain shops, eating places, and the presence of a devotional center as its greatest attraction. It has been dubbed as the "obsolete residence of the upper class" [23].

Side-by-side with Quiapo is the district of San Miguel, known for its prestige and class as it holds the seat and power of the country's political administration and the *Malacañan* Palace that serves as the house and office of the highest political person in the country. As such, existing height and density restrictions are in place in the area thus in effect preserving the heritage houses and structures. Likewise, the area's visual sightline is deemed safe as high-rise structures are prohibited from being constructed within the vicinity for the safety and security purposes of the *Malacañan* Palace. More than that, various government offices have taken the lead in practicing adaptive reuse of such built heritage structures by having their offices in some of the heritage houses. Due to this, the district of San Miguel can qualify as a heritage district which Ivan Henares addressed as the "old millionaire's row" on one occasion.

Apart from being the original site of one of the largest beer breweries in the world, San Miguel Beer Corporation, the area once served as the summer vacation destination for the country's millionaires as many elite families decided to construct their summer houses in the area enjoying the cold breeze from the Pasig River and its perfect sightline toward Rizal Monument to Roxas Boulevard and Manila Bay. It was a perfect vacation haven as the area was so peaceful, away from the busy life emanating from the city center Intramuros and its contiguous districts.

At present, San Miguel houses four churches of heritage value like Basilica of San Sebastian, San Beda Abbey, St. Jude Church, and the San Miguel Cathedral. Aside from this, several educational institutions can be found in the district which forms part of Manila's so-called "University Belt".

3.4 Sta. Ana and Pandacan

The district of Sta. Ana is known today as the community by the river due to its proximity to the popular Pasig River. Apart from that, as the welcome marker of the district proclaims, Sta. Ana is also popular for being a historic community and a portion of it was declared as a histo-cultural heritage/overlay zone by the city council of Manila in 2011 after long being threatened by heritage destructions. In addition to its rich built cultural heritage, the district is also abundant with intangible cultural heritage due to its rich pre-Hispanic kingdom communities.

During the Spanish era, the area became one of the community settlements for the Spaniards as its proximity to the city's capital and river transport system proved to be very vital. As among the few areas to be spared from the destruction brought by World War II, Sta. Ana still houses an impressive collection of at least 100 heritage houses that was dubbed the "Forbes Park of Manila" from Spanish and American periods as it became the enclave of Manila's rich and famous families. It is located at the end of most of Manila and is considered as the oldest settlement of the Pasig River, where most of the heritage houses were constructed and until now faces the river instead of the main alley.

Aside from the heritage houses, Sta. Ana also boasts pride in its 300-year-old church of Our Lady of the Abandoned in which paintings on its ceiling were declared

as national cultural treasures by the National Museum, as well as the burial site excavated beside it where skeletons and pottery dating from the eleventh century Sung Dynasty were discovered. Sta. Ana also used to be among the train stops of the popular *tranvia*. More than that, the residence of the Holy See, the Apostolic Nunciature, is also located in the area which became very popular due to subsequent visits of numerous Popes to the country during the post-colonization period. Aside from that, Pao Ong Hu, a Taoist Temple considered as a mixture of Taoism and Buddhism beliefs, is also located in the area nevertheless it was recently bought by a Chinese planning to convert the structure into a commercial complex. The temple stands beside the Nuestra Señora de los Desamparados Church which makes it unique as it resembles what Mr. Boyet Magale (personal communication, 6 August 2021), heritage advocate and tourist director of Manila Heritage Tours Sta. Ana, calls a "dialogue of faiths", a rare feat where two if not three different religious beliefs stand at one another.

Accordingly, over time there were numerous historical archaeological discoveries in the area of Sta. Ana. At one point, contractors of the Department of Public Works and Highways accidentally unearthed and damaged Chinese porcelain in the course of their road widening projects. The same was the case during the construction of the controversial Manila Green Residences, a high-rise condominium project, in which pieces of damaged old pottery and other artifacts, probably due to poor excavation, were accidentally discovered during the process (B. Magale, personal communication, 6 August 2021).

Today, Sta. Ana has been the consistent prime target of property developers due to its prime location of being near the business districts of Makati and Mandaluyong despite being declared as a heritage zone by the National Historical Commission of the Philippines in 2014. The significant heritage structure of the old Columbian Missionary house was demolished to give way to a development complex. This prompted the community to develop and strengthen their community-based heritage tourism program to preserve the community's shared heritage prompting the local city council to declare portions of the district as a heritage zone.

Right beside Sta. Ana is the district of Pandacan which serves as the connection to the San Miguel district across the Pasig River. Pandacan became known for the oil refineries located right at heart of the Manila. During the early days of community settlement, the area of Pandacan served as a perfect place for the oil refineries which were far from Intramuros, the center of commerce and community. Nevertheless, because of the swift spread of development and its affiliate demands, the area was staged with residential communities later on.

Pandacan was once dubbed the "Little Italy" and "Little Venice" of Manila, for its landscape is surrounded by *esteros* and canals leading to the Pasig River. It was more likely the reason why Pandacan became the cradle of opera and orchestral music performance in the country, which later on inspired the Filipino poet and playwright Francisco Balagtas known for the "*Florante at Laura*" masterpiece.

Pandacan also carries with it built heritage structures like the Pandacan Church that bears the image of the Sto. Niño or Holy Child which succumbed to a fire incident in 2020 thus lost its seventeenth-century wooden icon, *Santo Niño de Pandacan*. Apart from this, the former residence of the Leyte-based political clan Romualdez remains standing boastful and proud of being an example of a well-preserved heritage house.

3.5 Escolta and Sta. Cruz

Another integral part of Manila's tourism circuit is the district of Escolta, among the first communities established by the Spaniards in 1594. Escolta became the

commercial district of Manila developed progressively by its proximity to Intramuros and Binodo and the Galleon Trade. If Binondo, San Nicolas, Sta. Ana and San Miguel have a collection of heritage houses, on one hand, on the other hand, Escolta holds the record for most of the country's first commercial structures such as ice cream parlor, department store, elevator, etc. as manifested in the area's landscape filled with heritage structures and buildings. Escolta was once known as the "Queen of Streets of Manila", serving as the premier central business district of the city.

In a list compiled by Coconuts Manila [24] presented in Cruz [25], at least nine built heritage structures were identified in Escolta with the El Hogar Filipino Building built in 1914 on top of the list. Another heritage structure in Escolta is the Capitol Theater built in 1930 under the designs of Juan Nakpil as the first air-conditioned theater in the country while showcasing an Egyptian-inspired step-pyramid. The Uy Chaco Building is another heritage structure in the area, built among the first skyscrapers of Manila that once served as general hardware for a Chinese businessman before being occupied today by the Philtrust Bank as among its branches. The once-cold storage of Ides O'Racca built in 1935 joins the list of skyscrapers in the area. History books mention that the Japanese once occupied the building during their invasion of Manila and situated machine guns on top serving as an efficient watch post due to its strategic location. The building was numerously ravaged by fire incidents and was managed to withstand a series of earthquakes in the area. Another heritage pride of Escolta is the old HSBC building built in 1922 serving as the bank's main office. Next on the list is the well-acclaimed 1922 structure of the Pacific Commercial building designed by national artist Leandro Locsin serving as the office of the First National Bank of New York, popularly known as Citibank. The structure was retrofitted today as the Juan Luna E-Services Building following the conservation principles of adaptive reuse. The Don Roman Santos building of 1894, which once housed the first savings bank in the Philippines, the Monte de Piedad Savings Bank is now occupied by the Bank of the Philippine Islands as its Sta. Cruz branch also stands at the premiere of the district. The Manuel F. Tiaoqui building, considered the first pinned-wall building in the country is also located in the area. Another prime heritage structure in Escolta is the former Roxas building built in 1934, popularly known today as the Regina Building characterized as a neoclassical and beaux-arts style structure.

Other notable heritage structures in Escolta include the 1928 First United Building which once served as the Manila Post Office before being the site of the infamous Berg's Department Store. The building was retrofitted by its present owners catering to the principles of adaptive reuse, serving as the workspace of the HUB: Make Lab and commercial spaces for start-ups. The first elevator-operated building built in 1919 the Burke Building, together with the Natividad Building, the Calvo Building the former house of DZBB news radio station, and the 1965 Philippine National Bank Building joins the prestige heritage list of Escolta (**Figure 3**).

Escolta for the longest time has been the subject of concern of heritage activists as attempts to demolish the listed built heritage structures never seem to end to give way to modern development. Indeed, the heydays of Escolta are on the brink of forgetfulness as the area gradually lost its golden touch to decay and neglect. Gone are the days of the busy commercial life that lived by its name as the queen of streets of Manila, and only a few Chinese entrepreneurs have decided to stay most are a members of the Escolta Commercial Association, incorporated who continue to aspire to save what was left and bring back the lost glory of Manila's "Queen of Streets".

Alongside Escolta is the district of Sta. Cruz which beforehand was practically a marshland and rice paddies that were later converted by the Jesuits to a housing

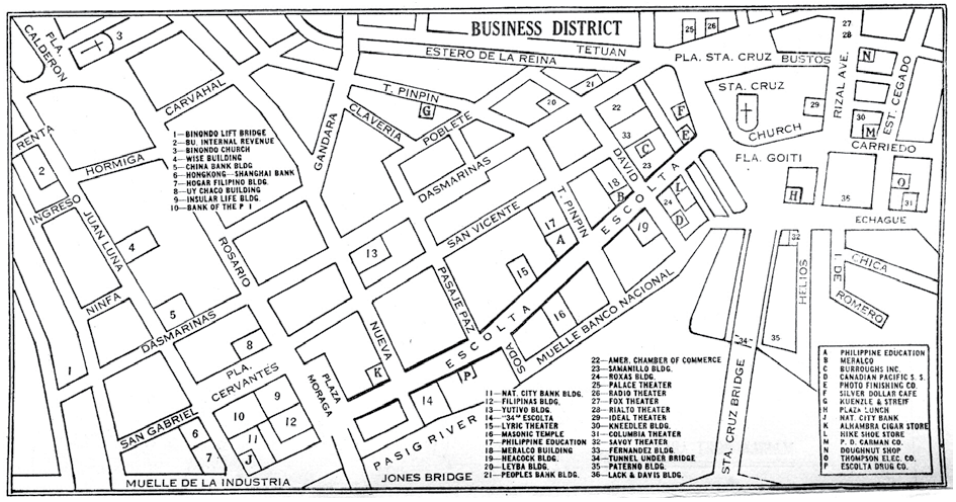

Figure 3.
Old map of Escolta, Manila. Available from: http://www.lougopal.com/manila/?p=83.

community that patronizes the Our Lady of the Pillar. Because of the district's contiguity to Binondo and San Nicolas, the area catered primarily to Chinese residents who explored the outskirts of the Parian thus becoming an integral part of Manila's "Downtown" together with Escolta, Avenida Rizal, Quiapo, Binondo, and Sta. Cruz. Manila's downtown was known for its blend of business and residence at the same time. The district's nearness to the Pasig River became one of its greatest assets for it allowed ships to load and unload their cargo as well as board and alight passengers, thus practically becoming a ferry transport terminal and market at the same time. Add more to that the development of Meralco street cars otherwise known as *tranvias* which allowed greater people traffic in the area. Plaza Goiti, today known as Plaza Lacson right in front of the BPI building in Carriedo, served as the central station of the *tranvias*. Apparently, while Escolta caters to the upscale strata, Sta. Cruz attractions are mostly entertainment bars that later were turned into clubs by the Americans, theaters, department stores, and thrift shops, as well as panciterias and restaurants that serve as places of formal and informal gatherings and meetings [26].

Just like Sta. Ana, Sta. Cruz was also spared from the ravages of World War II destruction as Japanese forces voluntarily left the area before the start of the "Battle of Manila". With much of the structures remaining intact except for the Sta. Cruz Bridge and the Sta. Cruz Church, the district likewise showcases notable built heritage like the Sta. Cruz Parish Church or the Our Lady of the Pillar Parish Church, the Carriedo Fountain, the Roman Santos Building, and the Monte de Piedad which is the first savings bank in the country.

Nevertheless, despite escaping the wrath of the war, there are three graveyards located in the district namely the Chinese Cemetery, Manila North Cemetery, and the La Loma Catholic Cemetery. In addition, several tombstones were found within the perimeter of the Sta. Cruz Church. As explained by De Viana [27], the sprawl of cemeteries in Manila was due to the cholera outbreak in Manila in 1882 claiming many lives. Such prompted the Spanish government to immediately construct cemeteries, thus Sta. Cruz having the available land space during that time for being a previous

marshland and due to its nearness to the residential districts without having so much of its own was chosen to be the location of these cemeteries.

3.6 Tondo I and Tondo II

Another hub of Manila's heritage tourism is the district of Tondo, considered the largest in terms of population size and land area, as well as the densest which Carlos Celdran and Catriona Gray once called "the slums". According to Carlos Celdran, Tondo has always been the resettlement area dating back to the Spanish era. Ever since the area of Tondo is known for its kingdoms as most territories were ruled by a local chieftain who came from the same ancestry thus making them relatives by blood.

Prior to the arrival of the Spaniards, Tondo was said to be ruled by the Rajah such as Lakandula, Soliman, and Rajah Matanda but was later subdued by the Spaniards thus agreed to contract an agreement with the latter thus at one point in history Tondo became the capital of the country which territories expanded as far as Bulacan up to the mountains of San Mateo, Rizal.

Tondo was a perfect community area back then as bodies of water surrounded Tondo such as the Pasig River, the Manila Bay, and some *esteros* and canals making it a vital community during the early days of maritime trading. More than that, it was considered a rival entrepot to Intramuros as Tondo had better control of the entry point from Manila Bay to the Pasig River such that Spaniards during their initial arrival in Manila docked at Manila Bay forced to battle the local chieftains for sovereignty.

As the Chinese merchants enjoyed their newly given liberty to travel and right to abode, many merchants decided to stay in the Tondo area, similar to Binondo which served as an extension for the Galleon Trade. What separates Tondo from Binondo is the popular shopping market best known for cheap finds in the area of Divisoria which translates to Spanish as "boundary". The Binondo part is best known for its stone houses while the Tondo part was comprised of bamboo and thatch houses that commonly fall prey to firebreaks.

At present, Tondo is known for being a warrior haven such that common connotations about the area include being the harbor of gangs and fraternities known for their riots and street fights. More than that, Tondo is one of the places in Manila that hardly attracts tourists, aside from its trademark of being the hub of mobs, it is also known for its ambulant vendors and the petty crimes that go with it such as theft and pickpocketing.

Nevertheless, such an image was not manifested without any cultural and historical reference for the district's patron was the Infant Jesus which is tagged as the "warrior-child". Historically, it became the heart of the Philippine resistance movement during the Spanish invasion. Jose Rizal, after returning to the Philippines from Spain in a failed effort to save his family from eviction, organized the *La Liga Filipina* in this area which became the foundation of the soon-to-be-founded revolutionary group, *Katipunan*.

Even before the revolutionary group *Katipunan* was founded, Tondo already manifested a series of resistance against the Spaniards as Rajah Soliman, who once ruled the area before being defeated by Legazpi, once rallied his allies and fought the colonizers but on a losing effort. Additionally, Lakandula also once attempted to revolt against Legazpi due to political differences but was eventually pacified when the former was assured of exemption from paying taxes to the Spanish government.

More than that, a series of local revolts occurred including the resistance from the son of Lakandula, Magat Salamat, however, ended up losing his head at the hands of the Spaniards [4].

Tondo by being a cornerstone of the Philippine nationalism movement is sure to host numerous prominent Filipinos including Andres Bonifacio, who was born in the area, and Emilio Jacinto raised in Tondo and considered as the brains of the group. Additionally, the public plaza in the area, Plaza Moriones was once the center of the political demonstration by labor unions seeking social justice and vindication, thus incubating the first Communist Party of the Philippines. Aside from this, Tondo also became the cradle of many literary greats inspired by the socio-political developments in the area, including Huseng Sisiw, Bienvenido V. Santos, and Amado V. Hernandez to name a few [4]. With so many prominent personalities, it is not surprising that numerous heritage houses can be located within the vicinity.

Despite its population density, Tondo contributes to the list of heritage possessed by the City of Manila. Among the list is the Sto, Niño church otherwise called Tondo church which houses the iconic Infant Jesus in a red cape holding a cross-bearing staff. The parish is the oldest in the country and popular for its annual festivity, second to the popularity of the Feast of Quiapo, usually frequented by tourists in addition to the devotees.

Tutuban also hosts one of the original train stations of the Manila Railroad Company, presently known as the Philippine National Railways, operating the Manila-Dagupan, Pangasinan line. The Tutuban Station served as the Manila station of the said railway in 1887. Recently, the heritage station is planned to be incorporated into the North-South Commuter Railway" under the "Build, Build, Build" project of the Duterte administration.

In 2020, the Manila local chief executive aspires to address the plight of the informal settlers in the area by putting up high-rise tenements complete with basic facilities that will be called "*Tondominium*" much like a condominium with 2022 as the target completion date.

If the present connotation to the district of Tondo is popular for its slum area, back then the area was constituted by a combination of the proletariat and the bourgeoisie which resembles the era of industrialization in the country. Tondo can be a good example of a socialist state envisioned by Marx in his manifesto.

Today, Tondo is categorized into two districts, Tondo I, and Tondo II, the former is the busy and working zone while the latter is considered as the orderly and quiet neighborhood. Nevertheless, while there appears to be a character distinction between the two, both converge at Divisoria for their shopping thrills.

3.7 Sampaloc and Sta. Mesa

Sampaloc and Sta. Mesa is two districts lying on the outskirts of the City of Manila near its boundaries, yet they still form part of the city's tourism hubs. Sampaloc is a district in Manila known for its numerous colleges and universities, hence tagged as the "University Belt". These include the Art Deco campus of Far Eastern University built in 1939 comprised of five Art Deco Buildings and was declared as a UNESCO Asia-Pacific Heritage Site. Also located in the area is the University of Santo Tomas (UST) established in 1611 and was considered the oldest university in Asia. Four UST structures were declared by the National Museum in 2010 as national cultural treasures, this includes the UST Main Building, the Central Seminary, the Arch of the Centuries, and the University's Open Spaces. The National Historical Commission of

the Philippines declared the UST Manila Campus as a National Historical Landmark in 2011, in time for the university's quadricentennial celebration. Correspondingly, in the vicinity is the National University established in 1900 as the first non-sectarian coeducational facility in the country that used English as the primary language.

Apart from renowned cultural and historical schools, Sampaloc also includes several ancestral houses such as the Jusay Ancestral House which served as one of the headquarters of the Japanese Imperial Army during their occupation. Another heritage site in the district is the Gota De Leche Building which served as the haven for impoverished children whose mothers had difficulties in providing breast milk, a fine example of heritage conservation after its renovation in 2002 adapting local craftsmanship and materials in the preservation of the tilework, grills, and capiz windows. The edifice was a World War II survivor and was designated as an Important Cultural Property by the National Museum in 2014 [28]. Sampaloc also became popular during the Filipino-American War where the former accused the latter of shooting a Filipino soldier on the San Juan bridge thus further antagonizing both parties which the NCCA later clarified as taking place in a different area. More than that, one cannot complete a visit to Sampaloc without checking out the Dangwa Flower Market, named after the bus station adjacent to it where until now fresh flowers from different parts of the country are being sold.

Nonetheless, Sta. Mesa used to be part of the wider Sampaloc district until 1911 after Sta. Mesa had its parish church and was established as a separate legislative district. Sta. Mesa, much like Sta. Cruz was a community of the Jesuits under the patronage of the Sacred Heart of Jesus. During the Spanish era, Sta. Mesa is one of the favorite neighborhoods of aristocrats for their summer houses enjoying the cool breeze of the Pasig River similar to San Miguel. Moreover, Sta. Mesa's setting of being far from the city center gave a discreet neighborhood accentuated further by the rows of *Ylang-Ylang* trees lined on the streets that produced a pleasant smell to the surroundings comparable to perfume.

One of the heritage structures that still lie in the area though already dilapidated is the PUP Antique Mansion known better as the Carriedo Mansion which served as the house of the former Governor General Francisco Carriedo y Peredo known for facilitating a clean water system in Manila. It was also the site of the Sociego Mansion which was dubbed as "the Haunted House" by the urban folks for its scary setting cast by horror movies that were filmed in the mansion. Nevertheless, the structure was bought by real estate developer DMCI Holdings, Inc. in 2012 and recreated the mansion in Taguig City renamed Casa Real Mansion serving as an events venue with most of the original parts, structure, and design maintained in what the developer branded as an example of "creative reconstruction".

3.8 Ermita and malate

Ermita is among the popular districts in the City of Manila today, mainly because it has been dubbed as the new entertainment district of the city. Who cannot notice the busy life in the streets of Ermita whether daytime or nighttime? One cannot surely miss the congested traffic in the area in the morning as city dwellers flock to the area as job seekers hop on from one recruitment agency to another hoping to look for better job opportunities overseas. Aside from being an overseas employment recruitment hub, many commercial centers sprouted like mushrooms in the area adding more to the heavy people traffic. But as the sun sets in the afternoon, Malate starts to evolve into a party district for nightcrawlers as bars and clubs start to operate.

Ermita started to become a prominent place during the American occupation as the Americans decided to further develop the city as a civic center. According to the plan, government buildings will rise in the district to include the city hall for the city government, the offices of the three branches of government, and a judicial hall. In addition, a state-run educational facility (University of the Philippines) and a hospital (Philippine General Hospital) were among the plans. Accordingly, the plan was for Ermita to be the new core of the emerging nation-state to be established by the Americans in their new colony [29]. To complement the design, entertainment activities were established as well in the area such as parks and public plazas such as the Rizal Park or Luneta to top off the list.

But the aftermath of World War II disrupted the grandiose plans for the district in the so-called "Rape of Manila" or "Manila Massacre". Even with the conservation and renovation efforts instigated by the Americans to reestablish the area, one by one families started to move to the suburbs as the area started to become unlivable due to poor street lighting, unregulated street vendors, and proliferation of pickpockets and thieves thus what used to be Manila's high-class gradually acceded to low-class commercialization. Today, Malate is often categorized as a "red light" district as bars and clubs shine every night known for prostituting men and women of all ages mostly foreigners.

Despite being far away from the ideal civic center conceptualized by the Americans, numerous structures constructed during the American were able to withstand the ravages of war however threats are far from over as development continues to exert pressure on these surviving heritages. It started with the demolition of the famed Jai Alai building in 2000 that presently stands as a vacant lot beside the controversial Torre de Manila which became the tipping point for a Philippine heritage law to be enacted. Moreover, the Angela Apartments was demolished in 2009 after the owner ran out of funds for its conservation plan and thus decided to demolish the property rather than incur further losses for maintaining an unprofitable property. The same fate loomed over the pre-war structure of the Admiral Hotel and Michel Apartments, which were demolished in 2014, as well as the case of the Philam Life Building which was demolished in 2020 after property developer, SMDC, bought the property with the plans of converting the heritage edifice to another high-rise structure. Nevertheless, the Army-Navy Club was given a new life after it was restored and rehabilitated as the Rizal Park Hotel following the principle of adaptive reuse, as well as the Luneta Hotel adapting the conservation principle of old-and-new.

Still, Malate houses several prominent heritage structures in Manila including the Rizal Monument in Rizal Park, the Malate Church, the National Museum, the Quirino Grandstand, the newly renovated and preserved national heritage structure Metropolitan Theater, the Manila Hotel, and the Masonic Temple of Ermita to cite a few.

Much the same, Malate's twin sister, Ermita was once an integral part of Manila's grand civic center based on the 1905 Burham Plan of Manila of the Americans with most of the residential properties exclusive to Americans and their families. The two districts were where the wealthiest families of Manila used to live and were considered the first Forbes Park. However, the Ermita district suffered the same fate as its twin sister during wartime. Hence, with some American families deciding to return to their properties, some decided to permanently leave the area leaving many establishments unattended which was taken over by vagrant people. But after the local government commenced cleaning the two districts, business establishments like restaurants, bars, clubs, and hotels gradually sprouted in the area which facilitated its transformation to a commercial district with a portion of Malate becoming a "red light district".

Notwithstanding, Malate is the site of some heritage landmarks such as the De La Salle University, the newly preserved and renovated Rizal Memorial Sports Complex, and the *Tanghalan Pambansa* inside the Cultural Center of the Philippines.

4. The stakeholders of heritage and development in the City of Manila

There are numerous stakeholders involved in the issue of heritage conservation in the City of Manila. Following the principles of stakeholders engagement by Wang et al. [16] and Góral [17], this study grouped the stakeholders into four consisting of 1) the national government agencies; 2) the local government of the City of Manila; 3) the private organizations and business groups; and 4) non-governmental organizations, community-based organizations, and heritage advocates.

Generally, the role of national government agencies which includes the Department of Tourism (DOT), the National Historical Commission of the Philippines (NHCP), the National Commission for Culture and the Arts (NCCA), and the Intramuros Administration (IA), has been limited to laying down of overarching principles and monitoring of compliances to existing cultural heritage laws and policies.

On one hand, the DOT serves as the government's lead agency in promoting tourism in the country, nevertheless, its programs have been limited in promoting heritage properties to be prime tourist destinations. On the other hand, the NCCA and its cultural heritage arm, the NHCP, have been at the forefront of promoting heritage conservation both in principle and in practice but their regulatory powers have been generally constrained to oversight. Moreover, the Intramuros Administration enjoys utmost control and supervision of heritage conservation but is limited to their district only.

Contrastingly, the local government of the City of Manila holds a prerogative on cultural heritage conservation within their jurisdiction as they have the mandate to provide clearances for any significant developments involving any cultural heritage site such as demolition permits, building permits, renovation clearances, etc. They also have the power to implement zoning policies that will ensure the preservation of built cultural heritage structures in their area such that most of the interview respondents of this study refer to the local government as the vanguard of cultural heritage conservation.

Nonetheless, non-governmental organizations, community-based organizations, and heritage advocates can only do so much as their role has been traditionally limited to being reactionary in the forms of protest, complaints, and filing of suits against possible heritage conservation violators. Recently, the group assumed a proactive stance on heritage conservation as movements calling for better heritage management are on the rise hence assuming a supervising role such that the local government has considered some of them as members of the technical working group, committee members, and capacity-building seminar participants.

However, private organizations and business groups have the lowest level of participation and engagement as reflected in the interviews as they were rarely consulted in the formulation and implementation of cultural heritage programs and policies.

As different stakeholders play different roles, each likewise possesses their expectations as reflected by their engagement and participation level as summarized in **Table 3**. Hence, the varying interests of each stakeholder pose an imminent tension and contribute to remote collaboration. Such makes the whole process very complex with each trying to advance their interest and trying to outwit the others.

Stakeholder	Interests	Participation Level	Expectation
National Government Agencies	Community well-being, Tourism development	Medium	Promoting and preserving cultural heritage
Local Government	Urban planning/zoning, Job creation, Poverty reduction	High	Promoting and preserving cultural heritage
Private Organizations and Business Groups	Business profit, Maximum return for minimal investment	Low to Medium	Experiencing cultural heritage (end-user)
NGOS, CBOs, Heritage Advocates	Sense of place, Urban identity and pride, Historical Preservation	Medium to High	Preserving the authenticity of cultural heritage

Table 3.
Stakeholder analysis matrix.

5. The heritage and development tension

The cases of heritage destruction in the City of Manila mentioned in the previous chapter confirm the conflict between heritage and development, but the findings of this study provide that the prevailing tension is the result of poor awareness of the economic significance of cultural heritage hence pining on the overall Filipinos' lack of cultural heritage consciousness. **Table 4** summarizes the key points gathered from the interviews.

National government		
Name of organization	**Key informant**	**Key points**
A. Intramuros Administration	Mr. John "Rancho" Arcilla	"Cultural heritage conservation can improve the people's quality of life not just in terms of economic development but social development as well."
B. Department of Tourism	Ms. Catherine C. Agustin	"Heritage conservation is a significant action to sustain the value, meaning, and significance of cultural resources from the past for the use of present and inspiration of future generations."
C. National Commission for Culture and the Arts	Mr. Lawrence Charles E. Salazar	"The city administrators need to present a clear concept of sustainability concerning the local government's cultural heritage conservation efforts."
D. National Historical Commission of the Philippines	Arch. Ma. Luisa Valerio	"The NHCP nevertheless reiterated that the responsibility of heritage protection primarily lies with the concerned local government unit as they are at the vanguards of heritage preservation."
Local government		
E. City of Manila, Department of Tourism, Culture and Arts of Manila	Mr. Ronald Flores	"The conflict between heritage conservation and pursuit of economic gains subsists for the case of the City of Manila, but heritage conservation can be used for economic development at the same time."
Non-governmental organizations, community-based organizations, heritage advocates		
F. Heritage Conservation Society	Mr. Gio Abcede	"Heritage sites should not be just about preserving the esthetics features but, should be a tool in food security."

National government		
Name of organization	**Key informant**	**Key points**
G. HUB Make Lab	Mr. Roberto Sylianteng	"The City of Manila has a rich cultural heritage that can be used as an asset."
H. UST Center for Conservation of Cultural Property and Environment in the Tropics	Dr. Eric Zerrudo	"There is indeed a big money in heritage, stressing out that *nakakain yan!*. It is important to see the overall cultural heritage conservation framework of the City of Manila and not just at the physical composition of the structures which became the foremost consideration in the conceptualization of the Manila tourism development plan."
I. Santa Ana Heritage Tours	Mr. Boyet Magale	"Heritage can coexist with modernity."
J. ICOMOS International	Dr. Ivan Anthony S. Henares	"The real conflict does not exist, it's just a product of poor cultural education."
K. Ateneo De Manila University, Institute of Philippine Culture	Dr. Fernando Nakpil Zialcita	"The inevitability of commodification of culture needs to be equalized by sustainable growth and not just desire for the mass market to generate bigger and better profit."
L. Old Manila Walks	Mr. Ivan Man Dy	"The City of Manila stands to benefit the most among the cities in Metro Manila in terms of cultural heritage tourism due to its rich history and culture."
M. San Sebastian Basilica Conservation and Development Foundation, Inc.	Ms. Marianne Claire Vitug	"The tension between heritage conservation and developments is a case of false dichotomy denying the argument that development cannot proceed by clinging to heritage."
Private organizations and business groups		
N. Philippine Postal Heritage Walking Tour	Mr. Lawrence Chan	"The tension rises when vested interest between contesting stakeholders take place."
O. Meaningful Travels	Mr. Jerome Carolino	"The conflict tends to start when somebody tries to circumvent the process and cut on expenses."
P. Manila for a Day	Mr. Dustin Ancheta	"Hyper- commercialization needs to be avoided, instead a balance between commercialization and preservation should be adapted."

Table 4.
Summary of informant's key points.

Tourism Operations Office Chief Mr. Ronald Flores of the local government of Manila admits that the conflict between heritage conservation and pursuit of economic gains subsists for the case of the City of Manila, but Mr. Flores believes that heritage conservation can be used for economic development at the same time (personal communication, 29 June 2021). It was the same pronouncement made by urban planner and lawyer Mr. Mark Evidente and heritage advocates Mr. Ivan Man Dy and Mr. Boyet Magale believing that heritage can coexist with modernity.

In the case of San Sebastian Basilica Conservation and Development Foundation, Inc., the executive director Ms. Marriane Claire Vitug considers the tension as a case of false dichotomy denying the argument that development cannot proceed by clinging to heritage. According to the executive director, the benefits of heritage conservation vis-à-vis tourism development have been proven already in different cities across Europe, in some parts of Asia, and locally in Vigan, Ilocos Sur, and Iloilo City (personal communication, 28 September 2021).

Moreover, ADMU IPC director Dr. Fernando Zialcita recommends that finding symmetry between the two extremes is the main key mentioning that development should likewise take into consideration the environmental implications and not just pure profit stating the case of Boracay Islands in Kalibo, Aklan (personal communication, 3 September 2021). Hence, the capitalist mindset has been in the works in the issue of heritage conservation such that mass market has been the main initiative where the development criteria used are based on the quantity of tourists and amount of money it generates but excludes the environmental and cultural heritage price it has to pay.

Director Dr. Eric Zerrudo of the USTCCCPET (personal communication, 7 May 2021) on another point that in some instances over-tourism has become the problem that has generated irreversible damage to the heritage that it was supposed to promote and protect such that development should not be one-sided but instead has to be sustainable. Tour operator Mr. Dustin Ancheta (personal communication, 18 May 2021) likewise recommended that hyper-commercialization be avoided, and a balance between commercialization and preservation should be adopted instead.

Meanwhile, ICOMOS International Secretary-General Dr. Ivan Henares (personal communication, 13 August 2021) even thinks that real conflict does not exist, it's just a product of poor cultural education. More so, tour operator Mr. Jerome Carolino (personal communication, 2 May 2021) of Meaning Travels PH reiterated that conflict tends to start when somebody tries to circumvent the process and cut on expenses. Tour operator Mr. Lawrence Chan of the Philippine Postal Heritage Walking Tour shared the same contention that tension rises when vested interest between contesting stakeholders takes place (personal communication, 1 May 2021).

Given the various priorities and views of the different stakeholders, heritage preservation appears to have a tug-of-war of political interest. The local government needs to balance the interests of all stakeholders involved in this political activity. Primarily, the local chief executive who serves as the main decision-maker needs to figure out the best decision based on the different political interests at stake especially if there is an election coming up. More so, the limited tenure given to a single term of office is one of the common hindrances to any comprehensive development program as observed by director Dr. Eric Zerrudo (personal communication, 7 May 2021). It was the same predicament mentioned by the Secretary-General of ICOMOS International Dr. Ivan Henares (personal communication, 13 August 2021) citing that as local leadership changes typically change in plans go with it.

The NHCP nevertheless reiterated that the responsibility of heritage protection primarily lies with the concerned local government unit as they are at the vanguards of heritage preservation. Prior to the issuance of any structural clearances such as construction or demolition permit, the developer needs to secure clearance from the local government which is supposed to scrutinize or ask for the assistance of attached agencies in the proper conduct of investigation and assessment (Architect M. Valerio, personal communication, 27 April 2021). Furthermore, even if policies and laws are made available if not applied proactively will still not make sense. Hence, even if the local government of Manila has an inventory of properties of cultural importance if building officials responsible for issuing building clearances do not integrate it into their inspection and investigation process, the inventory which took so much effort to be consolidated will be rendered insignificant (Dr. I. Henares, personal communication, 13 August 2021). Such highlights the loopholes and shortcomings in the proper implementation of existing cultural heritage laws and policies in the country.

A point that was mentioned as well by Mr. Ronald Flores, the Tourism Operations Office chief of the City of Manila (personal communication, 29 June 2021), citing that though laws exist that guarantee the protection of cultural heritage in the country, the loopholes provide a way to circumvent the law without breaking it. Hence, national policies on cultural heritage should likewise be updated regularly to fit the dynamic character of cultural heritage (Dr. I. Henares, personal communication, 13 August 2021).

Urban planner and lawyer Mr. Mark Evidente (personal communication, 4 August 2021) concurred that politics is indeed a factor in cultural heritage conservation. Such that if policies and procedures are clear and there was no room to circumvent the law, therefore nobody could take advantage of cultural heritage. There should be clear enforcement of zoning by the local government. Similarly, Atty. Evidente mentioned that having laws and policies protecting heritage is necessary though the law is not perfect, if the community itself does not give significance to its heritage, policies are rendered useless. The problem lies with the institutional and social values of the people. The market should follow the law and not the other way around.

Mr. Boyet Magale, in his capacity as a heritage advocate in the district of Sta. Ana, Manila concurred that most of the concerns about cultural heritage preservation are politically inclined citing the case of the River Green Residences, a high-rise development structure in their district. It was a mystery for Mr. Magale how the developer was able to secure the necessary clearances granted that the district was already declared as a histo-cultural heritage overlay zone, much like the case of the Torre de Manila in Ermita, Manila. A different case is the petition by the new owner of the Pao Ong Hu Taoist Temple in Sta. Ana to have it delisted from the list of Important Cultural Property declared by the National Museum after plans of converting the temple to a commercial complex were revealed. Mr. Magale was once more curious why such a request was even considered by the same institution that worked on its declaration as important cultural property, providing that such unfortunate circumstances take place because of people in authority's vested interest and capitalist ethic of some business groups (personal communication, 6 August 2021).

The same point applies to the fate of the Jai Alai Building in Taft Avenue, Manila. The long-abandoned building was ordered to be demolished by the local government of Manila to give way to the construction of the new Manila Hall of Justice which never took place. Such can be considered as a case of wasted cultural heritage as the building could have been better left alone instead of being demolished without definite plans. Moreover, since the location of the former Jai Alai building stands within the perimeter of the controversial Torre de Manila, it can speculate that the Jai Alai building was demolished to facilitate the possible sale of the land to private land developers such as the DMCI Homes.

It is also the same point suggested by Dr. Zialcita (personal communication, 3 September 2021) stating that during the 1930s, the City of Manila was considered the most beautiful city in Asia but suddenly lost its prestige and glory because of powerful economic interest at work. An idea that was reiterated as well by the heritage advocate Mr. Ivan Man Dy (personal communication, 10 May 2021) saying that in the perceived tension between heritage and modernity, it has always been the economic and business side that comes first such that heritage has taken the backseat despite the existence of heritage law, a manifestation of failure on the part of the local government.

Given the complex nature of cultural heritage such that varying interests are at stake, political interplay has taken place and affirms that high money and great profit

are at stake in cultural heritage, whether taken positively through conservation or negatively through development.

6. Conclusion: Cultivating a heritage-driven economy for the City of Manila

This chapter presents how the tension between heritage conservation and tourism development objectives impacts the sustainability of the City of Manila. Generally, goal 11 of the SDGs prescribes that culture matters. It requires cities of the world to be "safe, inclusive, resilient and sustainable". Listed among its identified targets is "the strengthening of efforts to protect and safeguard the world's cultural and natural heritage." As society tries to find the symmetry between limited resources and unlimited wants, development has taken varying forms. Either grasslands and bushes or empty lots and spaces with unpaved roads characterize communities before; today, it has been dominated by residential properties, commercial centers, shopping malls, and other high-rise properties. Society has indeed undergone a rapid transformation. Nevertheless, such development did not happen without constrictions with cultural heritage serving as the front line. As communities take on the challenge imposed by modern living, it created a perspective that anything old is a representation of the backward past and, therefore, should be discarded; a practice that left the City of Manila in a state of urban decay and greatly affected the city's sustainability.

Development has been branded as the evolution of traditional practices. It has been perceived as a future-oriented process hence modernization practitioners perceive cultural conservation as an obstacle that hinders improvement and stops progress and development. Some see cultural heritage as something without value or use and as a dead-end investment for the reason that it incurs a greater cost than the perceived benefits [30, 31]. It has greatly imposed challenges and dilemmas, particularly in developing countries such as the Philippines. As countries strive to catch up with the fast-paced development trends imposed by leading industrialized countries, cultural heritage usually takes the back seat. In support of this, Chohan and Wai Ki [32] and Nijkamp [33] added that in every phase of development, the structure of the city is not the only one affected but the built environment, the traditional physical composition, cultural and social values, and even the collective memory of the community are hampered as well. Therefore, cultural heritage is given the least priority in the process of urban development; an effort that is not given utmost significance unless its correlation with economic development has been identified [34]. Such became the foundation of the tension between heritage and modernity, past against progress, heritage versus development, history against economy, and soul versus stomach. It is a dilemma that the City of Manila is facing; whether to pursue the standard and commercialized way to development or a road less traveled through a heritage-driven economic development.

The findings of this chapter confirm that a conflict exists between the stakeholders involved in heritage conservation and tourism development of the City of Manila. As different interests clash (i.e., those of the Manila local government; national agencies such as the Department of Tourism, the National Commission for Culture and the Arts, the National Historical Commission of the Philippines, the Intramuros Administration; and private sectors such as tour companies and heritage advocates) the sustainability of the City of Manila is greatly compromised.

The mandate of promoting the overall development of tourism has been the cornerstone of the national government's policies, while the local government extends the concern to include developing the urban landscape and at the same time addressing other development concerns like poverty, job creation, and zoning policies. Moreover, the cluster of NGOs, CBOs, and heritage advocates focuses on the preservation of urban identity, the sense of place, and pride that comes with historical preservation; while the group of private organizations and business groups focus on the maximization of economic interest and business profit. In the end, cultural heritage takes the backseat as minimal attention has been given to its conservation.

The tension between heritage and development stems from the lack of awareness on the part of the stakeholders. To most, cultural heritage, tangible or intangible, is just an ordinary concept that nostalgic people still adhere to. Others see heritage as a hindrance to development as the old dichotomy of heritage and development provides such that the usual practice is for cultural heritage to give way to the principles of development leading to the destruction of built cultural heritage.

As the findings suggest, one common way to preserve cultural heritage is through cultural tourism. It is suggested that making cultural heritage economically viable, it can generate a creative economy that will put cultural heritage side-by-side with development, thus contributing to sustainable development [9, 35]. Several studies [11, 36–42] have considered culture as the "fourth pillar" of sustainable development. It is the binding element between the three pillars of environmental protection, economic growth, and social development.

Russo and Van der Borg [35] and Zerrudo [42] provide for a development model that puts heritage at the center and enables more effective development interventions in promoting sustainable growth, inclusiveness, equity, and diversity that will result in economic benefits and non-monetized benefits. Such a model has been dubbed the culture-oriented economic development model emphasizing heritage-driven development.

The capacity of cultural heritage tourism to generate tourism revenues has long been established. Looking at the landscape of Manila, it does not have any beach or pristine lake to offer unlike other tourist attractions in the country but Operation Chief Mr. Ronald Flores (personal communication, 29 June 2021) of the city's tourism department believes that the city being historically and culturally rich can spell the difference. USTCCCPET Director Dr. Zerrudo (personal communication, 7 May 2021) shares the same aspiration with Heritage advocate Mr. Ivan Man Dy (personal communication, 10 May 2021) in considering cultural heritage as the greatest asset of the City of Manila. The city might have lost its touch already due to urban decay issues, but ADMU IPC Director Dr. Zialcita (personal communication, 3 September 2021) believes that if managed accordingly and will try to adopt a more positive approach toward heritage conservation vis-à-vis urban development, the City of Manila has the power to regain its lost glory. Dr. Zialcita stated as well that the city should use its rich cultural heritage as storylines for their tourism program, by putting the money right where the mouth is [4].

Arch. Ma. Luisa Valerio (personal communication, 27 April 2021), the section head of the National Historical Commission of the Philippines' Architectural Historic Preservation Division, likewise asserted the power of using heritage as a driver for tourism. Similarly, tour operator Mr. Dustin Ancheta (personal communication, 18 May 2021) of Manila for a Day, believes in the long-term benefits of heritage preservation. Citing the case of the City of Paris, which after incurring damages from the war, decided to restore the city's landscape to its original form instead of reinventing it and

redeveloping the land industrially. Such efforts generated a cumulative effect that the value of properties near heritage areas, such as condominium prices, hotel rates, the value of the land and the businesses, rose significantly as decades went by. Hence, by destroying cultural heritage, its economic value is being devalued.

Relatedly, Mr. Gio Abcede (personal communication, 20 April 2021) of Heritage Conservation Society, a heritage advocacy group, believes that tourism can be a tool for food security. Tour operator Mr. Jerome Carolino (personal communication, 2 May 2021) of Meaningful Travels PH, one of the tour companies that operate and specializes in tours around the City of Manila, likewise agrees that cultural tourism, in particular, can lead to income generation. This resembles the opinion of USTCCCPET Director Dr. Eric Zerrudo (personal communication, 7 May 2021) that there is really big money in heritage.

Mr. John Arcilla (personal communication, 31 March 2021), the head archivist of the Intramuros Administration also implied that there can be direct and indirect benefits in harnessing cultural heritage. It can generate employment for the community at the same time it has the power to drive real estate prices as the spike in tourism can lead to higher demand. Likewise, Mr. Arcilla believes that cultural heritage conservation can improve the people's quality of life not just in terms of economic development but social development as well that the City of Manila can capitalize on to uplift not just the city but yield an inclusive development instead to improve quality of life including mental health and recover financially.

Such statements respond to the usual concern over cultural heritage conservation highlighting the tensions between past against progress, heritage versus development, history in contradiction to the economy, and soul versus stomach. As such, the City of Manila needs to capitalize on its greatest asset in pursuing development, which is its heritage. Looking at the historical configuration of the City of Manila, the city boasts an impressive collection of historical narratives that form part of its rich cultural heritage.

Heritage tourism is among the bright spots, if not the only remaining hope of Manila in regaining its lost glory and being at par with its neighboring Southeast Asian cities. Heritage is among the strongest points of the City of Manila given its cultural assets, urban fabric, and tourist attractions.

A historic urban landscape approach can be adopted by assessing the unique strengths of every district based on its history, culture, and identity. This approach can be best applied to the City of Manila in the development of its historical districts through tourism. Tourism has a huge economic impact that will promote a circular economy with direct economic benefits trickling down to individuals at the community level which includes artisans, ambulant vendors selling food and souvenir items, and parking attendants, among others. While the commodification of heritage seems to be inevitable, it is important to inculcate the benefits of having heritage-driven tourism to people. Financial resources for cultural heritage need to be generated and preserved, either from government subsidies, private sector contributions, or revenue-generating projects from the community. The best way to encourage heritage preservation is by making it profitable for community members. As Bell [43] posits, tourism requires the transformation of cultural resources to make them appealing and relevant to tourists. To complement this, it is really necessary to facilitate community-based heritage tourism that will promote a heritage-driven economy as a conservation strategy. It offers beneficial rewards to the community as it generates awareness, promotes livelihood, pumps up economic activity, and encourages sustainable care of heritage at the same time.

There is also a need to strengthen cultural and heritage awareness among the people. As the study found out, it has been this heritage neglect that instigates historical urban decay. Since very few are aware of their own culture, no one is willing to step up for it; hence will soon become forgotten values and missing identity. It starts with inculcating cultural education among students, educational trips to heritage sites and historical places should be encouraged especially for state-funded schools and academic institutions. It can be likened to a seed, very tiny, powerless, and helpless, but if sowed with passion can germinate into a sturdy tree that can incubate life.

As this study affirms, cultural heritage refers to the promotion of every sense of life colloquially. The success stories of heritage-driven development in other countries have laid down the cornerstone for culture to serve as the fourth pillar of sustainable development goals. Thus, the community must understand the relevance of heritage to their lives and learn how to find economic value to it. Instead, heritage appreciation and preservation should be done for identity recognition side-by-side with its corresponding tangible and intangible benefits. However, there is a lack of local studies that can debunk the view that cultural heritage cannot contribute to economic development.

Furthermore, the dynamic nature of cultural heritage necessitates a comprehensive review of existing laws and policies. The continuous demolition of built heritage structures is a manifestation of policy loopholes that require to be addressed to minimize opportunities for stakeholders to bend the law. Particularly, the process of reviewing and granting development clearances concerning heritage structures should be strengthened by ensuring transparency in every step of the decision-making process.

The absence of clear guidelines on heritage conservation involving private properties is one of the predicaments in heritage conservation. The development of Las Casas Filipinas de Acuzar, a heritage-themed resort is a case-in-point, where owners of heritage private properties experiencing financial constraints have no clear idea where to seek support, highlights the absence of a national law that grants incentives to heritage conservation. Such desperate situations developed a policy gap that the state failed to address until property developer and real estate magnate, Jerry Acuzar stepped in to fill the hole as Acuzar was offered by heritage property owners in financial despair to bail them out. Nonetheless, managing and preserving heritage properties across different places proved to be not feasible thus it was recommended to move all properties to one area that gave birth to the acclaimed heritage resort. The story of Las Casas Filipinas de Acuzar manifests a policy gap on how to conserve heritage properties that should have been the responsibility of the state but were passed on to private entities.

Such a story is no longer a novelty in the Philippines with many heritage property owners compelled to put their properties on the sale block rather than burdened with financial constraints in an attempt to preserve a heritage property with no definite return of investment aside from psychological reward, thus heritage preservation should prove to be financially rewarding as well.

Furthermore, the pending legislation on heritage conservation incentives and the cultural property sightline bill, also known as the "Anti-photobomber Bill" were steps geared toward the strengthening of heritage conservation in the country. Likewise, various local governments have taken the initiative in adopting local legislation granting tax incentives and exemptions to property owners that will adapt heritage conservation practices in preserving heritage structures. Specifically, the local government

of the City of Manila adopted ordinance no. 8385 in 2015 granting exemptions to owners of heritage structures declared by the NHCP from paying basic real property tax and special education fund taxes. But still much needs to be done before protection settles as the new default heritage outlook.

In conclusion, the various success stories of heritage-driven economy or cultural-oriented economic development across literature have proven that cultural heritage can generate a circular economy, thus spelling out the narrative of heritage versus modernity as a modern myth or urban legend. Indeed, heritage can work side-by-side with development.

In this study, a heritage-driven/culture-oriented economic development framework was presented by Zerrudo [42] and Russo and Van der Borg [35, 44], respectively, supporting culture as the fourth pillar of sustainable development. With culture and heritage serving as a core part of the economy's backbone through an effective development intervention of a sustainable urban revitalization, it can promote a creative economy by generating employment opportunities and improving existing economic conditions resulting in direct and indirect economic benefits, in addition to non-monetized benefits like personal-psychological reward of being proud to preserve the heritage and contribute toward ensuring future generations of a heritage to remember. Such ways can contribute to the improvement of the sustainability of the City of Manila in terms of overall quality of life and economic performance as represented by the People and Profit sub-indices.

Finally, this chapter ends with a quote from Dr. Seus.

> *Unless someone like you*
> *Cares a whole awful lot,*
> *Nothing is going to get better.*
> *It is not."*

List of abbreviations

Arcadis	Arcadis Design and Consultancy
ADMU IPC	Ateneo De Manila University Institute of Philippine Culture
CCCPET	Center for Conservation of Cultural Property and Environment in the Tropics
CBOs	Community-Based Organizations
DOT	Department of Tourism
GSIS	Government Service Insurance System
IA	Intramuros Administration
MDGS	Millenium Development Goals
MET	Metropolitan Theater
NCCA	National Commission for the Culture and Arts
NGOs	Non-Governmental Organizations
NHCP	National Historical Commission of the Philippines
PNB	Philippine National Bank
SCI	Sustainable Cities Index
SDGs	Sustainable Development Goals
UST	University of Santo Tomas
UN	United Nations
UNESCO	United Nations Educational, Scientific and Cultural Organization

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Chapter 6

Conceptualizing Historic Preservation Planning with Curatorial Management through a Critical-Educational Conceptual Framework

Adam I. Attwood

Abstract

Historic preservation planning plays an important role in maintaining the cultural and architectural heritage of communities. The practice faces several key challenges that influence its effectiveness and long-term sustainability. This chapter identifies three major issues in historic preservation planning: balancing development with conservation, maintaining authenticity in preservation practices, and addressing socioeconomic inequalities in heritage preservation. Each of these challenges carries important implications for the future of preservation efforts. Historic preservation planning is discussed in relation to curatorial management that is informed through Paulo Freire's lens of critical pedagogy. A combined conceptual framework is presented and discussed. As an educational practice, a rubric is posited to foster discussion of applying a critical lens to balancing development with conservation, maintaining authenticity in preservation practices, and addressing socioeconomic issues in heritage preservation.

Keywords: curatorship, historic preservation planning, Paulo Freire, critical pedagogy, sustainability

1. Introduction

Historic preservation planning and curatorial management are separate, yet related, concepts that are essential to material and non-material cultural heritage preservation. Several challenges have emerged in historic preservation planning and curatorial management that may best be addressed through a combined conceptual framework. As interrelated fields, historic preservation planning and curatorial management in museums may inform each other to address three major challenges that are addressed in this study: Balancing development with conservation, maintaining authenticity in preservation practices, and addressing socioeconomic inequalities in heritage preservation. Paulo Freire's critical pedagogy will be applied

to conceptualizing historic preservation planning with curatorial management [1]. A rubric for application is presented.

2. Background

The first major issue in historic preservation planning is the ongoing tension between urban development and conservation. Cities are often under pressure to expand, modernize, and accommodate population growth, which can place historic structures and neighborhoods at risk. Planners must weigh the value of preserving heritage sites against the economic benefits of new construction. This balancing act can lead to difficult decisions, especially in rapidly growing urban areas. The challenge is further complicated by the need to accommodate modern infrastructure while ensuring that new developments do not detract from the historical character of the area. If this balance is not maintained through best practices in historical preservation planning management, historical assets and artifacts could be damaged or lost [2].

A second substantial issue is the challenge of maintaining authenticity in preservation efforts. As historic structures age, they require maintenance, restoration, or in some cases, replication of original elements. Preservation planners must decide how much change can be made while still maintaining the authenticity of the site. The dilemma between restoration and adaptive reuse often leads to debates about what constitutes authenticity in preservation. In some cases, there is a temptation to reconstruct buildings in ways that sanitize or romanticize the past, erasing the imperfections that tell the full story of a place. Ensuring that preservation remains faithful to the historical context, materials, and techniques is crucial in preserving cultural integrity [2, 3].

The third major issue in historic preservation is addressing socioeconomic inequalities that influence which sites are preserved and whose histories are told. Historic preservation has often focused on iconic buildings and the histories of elites, while neglecting sites associated with marginalized communities. In many cases, preservation resources are funneled into well-known landmarks, while neighborhoods with significant cultural histories but fewer financial resources are left to deteriorate. This disparity may not only limit the scope of preservation but also may perpetuate systemic inequalities. Addressing this imbalance requires a shift in the prioritization of preservation efforts, helping to ensure that a more inclusive narrative is reflected in the built environment [2].

These challenges have implications for historic preservation planning as curatorial practice. The tension between development and conservation affects not only the esthetic and cultural value of cities but also their economic futures. Urban areas that prioritize preservation alongside development may be seen as sustainably livable, which can foster tourism and local investment. Conversely, cities that neglect their heritage in favor of unchecked development may lose the unique identity that makes them distinct. Long-term planning should consider both the preservation of cultural assets and the accommodation of future growth to ensure that cities remain dynamic yet rooted in their histories [2, 3].

The question of authenticity has implications for not just the present but also for how future generations engage with historical sites. If preservation efforts do not maintain the integrity of the original structures, there may be a risk of creating a disconnection between the past and present. Authentic preservation offers an opportunity for education and reflection, allowing people to engage with history in meaningful

ways. However, overly sanitized or inauthentic restorations risk reducing historical sites to tourist attractions, devoid of the complexities and truths of the past. As such, the preservation of authenticity is not just a technical issue but also an ethical issue [3].

Addressing socioeconomic inequalities in preservation is crucial for fostering a more inclusive and just approach to urban planning. When the preservation of cultural heritage is skewed in favor of elite histories, the narratives of marginalized communities are further erased from the urban landscape. A more equitable approach to preservation would ensure that diverse histories are represented, thereby enriching the cultural fabric of cities. This shift would require policymakers, preservationists, and local communities to advocate for the protection of sites that may not have the same financial backing but hold significant cultural value [2, 3].

The major issues in historic preservation planning—balancing development with conservation, maintaining authenticity, and addressing socioeconomic inequalities—are important to the future of heritage sites in general. The importance of these issues may tend to be situated in their capacity to shape how to potentially understand and engage with individual and collective historical perspectives and the understanding of those perspectives from more than one vantage point. As cities continue to grow and change, preservation planning should evolve to meet these challenges, ensuring that heritage sites are not only protected but also remain meaningful to future generations [4, 5].

3. Museums in historic preservation planning

Museums play a substantive role in historic preservation planning by safeguarding, interpreting, and presenting cultural and historical artifacts that represent the heritage of communities, regions, and nations. Museums may be one of the most important ways that people access historical artifacts and research-based interpretations of the past and present. Through their collections, exhibitions, and educational programs, museums serve as custodians of tangible and intangible history, ensuring that significant stories and objects are preserved for future generations. In the broader context of historic preservation, museums act as key partners in raising awareness of the importance of protecting historical sites and structures, while also providing a platform for public engagement with history [3].

One of the primary roles of museums in historic preservation planning is their ability to serve as repositories for cultural artifacts and historical documents that may otherwise be lost or forgotten. Museums preserve objects that are often directly connected to historic buildings, neighborhoods, cultures, or significant events, creating a link between physical sites and the stories they represent. For example, artifacts from historic homes, archaeological sites, or demolished buildings often find a second life in museum collections, where they are professionally conserved and interpreted for the public. In this way, museums contribute to the broader goals of preservation by ensuring that material culture is protected, even when the original site may not be [3, 6].

In addition to preserving objects, museums also play a crucial role in interpreting and contextualizing history, helping the public to understand the significance of preservation efforts. Exhibitions that focus on historic buildings, architectural styles, or local heritage can provide important context for why certain sites are worthy of preservation. Through educational programs, lectures, and interactive exhibits, museums help bridge the gap between the academic field of historic preservation and the general

public. This role is particularly important in fostering a sense of appreciation and advocacy for preservation efforts among community members who may play a key role in the decision-making process for supporting or opposing preservation initiatives [3, 7].

Museums often serve in an advocacy role for historic preservation at the local, national, and even international levels. They collaborate with preservation organizations, urban planners, and governmental bodies to raise awareness about the threats facing historical sites, such as urban development, neglect, or climate change. Many museums, particularly those that focus on local or regional history, work closely with preservation planners to identify sites of cultural significance that may be at risk. These partnerships can lead to the creation of preservation plans that safeguard not only the museum's collections but also the buildings and landscapes that are part of the broader cultural heritage [3, 8–10].

Museums also contribute to historic preservation planning through their role in documenting and preserving intangible cultural heritage. Beyond physical artifacts and buildings, museums often house oral histories, music, folklore, and traditions that are integral to a community's identity. This broader conception of preservation ensures that not only the architectural or material aspects of history are saved but also the social and cultural practices that give meaning to those spaces. By preserving these intangible elements, museums help keep the spirit of historic places alive, allowing communities to maintain a living connection to their past [3, 10].

The educational role of museums in historic preservation extends to training the next generation of preservationists and conservationists. Many museums are affiliated with academic institutions or offer specialized programs that train professionals in the techniques of artifact conservation, architectural preservation, and public history. These programs are vital for ensuring that the skills necessary to preserve historical sites and artifacts are passed down, thus securing the future of preservation efforts. In this way, museums act as centers of knowledge and expertise, contributing to the development of best practices in the field of historic preservation [3, 8–10].

The concept and practice of adaptive reuse is one of several roles that museums play in historic preservation planning. Adaptive reuse may apply to historic buildings, artifacts or material culture, or even intangible cultural processes that may result in important social movements on an individual and larger group basis [11]. Some museums are housed in repurposed historic structures, serving as examples of how adaptive reuse can both preserve a building's historical integrity and meet contemporary needs. By occupying and maintaining these buildings, museums not only preserve the structures themselves but also provide a model for other organizations and developers interested in adaptive reuse as a preservation strategy. The success of these projects demonstrates how historic buildings can continue to serve their communities in new and innovative ways, without sacrificing their historical value [3, 8–10].

Museums may have a goal—as part of their mission—to foster community engagement with preservation by providing spaces where the public can actively participate in the preservation process. Whether through volunteer programs, public forums, or community-based exhibitions, museums offer opportunities for individuals to become directly involved in historic preservation. This engagement is critical for building broad-based support for preservation efforts, as it allows community members to see themselves as stakeholders in the process. Museums, therefore, play a vital role in democratizing historic preservation, ensuring that it is not solely the domain of professionals but also a shared responsibility of the public [3, 10].

Museum curators are partners in historic preservation planning. They offer expertise, advocacy, and public engagement that enhance efforts to protect and conserve

cultural heritage. Through their role as stewards of history, interpreters of the past, and centers of education, museums contribute to the preservation of both physical and intangible heritage. By fostering public appreciation for preservation, training future professionals, and exemplifying adaptive reuse, museums ensure that historic preservation remains a dynamic and inclusive process that benefits future generations. This process may be complicated by changes in popular perception of certain artifacts and their provenance, which may simultaneously be influenced by curatorial interpretation [3, 10].

4. Conceptual framework: Integrating historic preservation planning and curatorial management with Freire's critical pedagogy

4.1 Historic preservation planning and curatorial management

There is overlap between historic preservation planning and curatorial management, but the overlap is like gears that work with each other rather than overlap like a Venn diagram. Freire's critical pedagogy may be seen as an ethics concept that seeks to democratize or at least involve all stakeholders in decision that affect their material culture or other shared heritage artifacts. Critical pedagogy also helps foster conversation in heritage preservation processes that add inclusive practice as essential in refocusing discussion on artifact ownership and adaptive reuse in how they may affect local communities [1, 8, 9]. As seen in **Figure 1**, the intersection of historic preservation planning and curatorial management represents a critical nexus or praxis where development, conservation, and authenticity converge.

Critical pedagogy applied as a praxis approach may inform historic preservation planning and curatorial management, because those concepts are, in part, educational. Given the educational value of these fields for the general public, Freire's critical pedagogy may come into focus as even more relevant for positing a rubric to combine these interrelated practices. As seen in **Figure 2**, developing a rubric

Figure 1.
Ethics, curatorial management, and historic preservation planning are like gears that work with each other.

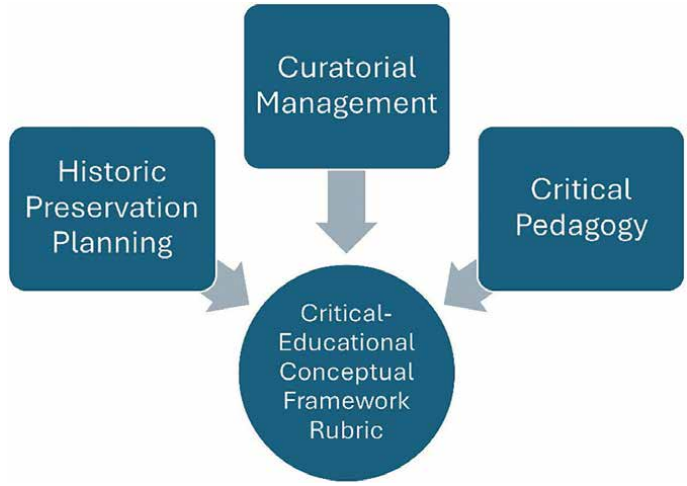

Figure 2.
Principal concepts informing a critical-educational conceptual framework rubric.

for students of historic preservation planning and curatorship may foster critical thinking skills of how these may interact with each other. As provided in Appendix A, a framework rubric is posited, which seeks to address the complexities inherent in balancing these areas. This framework rubric focuses on addressing development pressures, the maintenance of authenticity, and socioeconomic inequalities in heritage preservation. By exploring these dimensions, a critical framework may aim to create a more nuanced approach to preserving shared cultural heritage.

Historic preservation planning and curatorial management should perhaps recognize the inherent tension between development and conservation. Urban growth and economic development may often lead to pressures on historic sites and structures. An effective preservation strategy involves a proactive approach that integrates conservation principles into the planning process. This requires collaboration among stakeholders, including urban planners, developers, and preservationists, to ensure that new developments do not compromise the integrity of historic resources but rather enhance them through thoughtful design and adaptive reuse [3].

Maintaining authenticity in preservation practices is another principle of this framework. Authenticity, as defined by preservation standards, refers to the integrity of the material, design, workmanship, and setting of a historic property. Curatorial management plays a crucial role in ensuring that preservation efforts adhere to these standards. This involves rigorous documentation, conservation techniques that respect original materials, and an ongoing commitment to preserving the historical narrative of the site. Authenticity is not merely about preserving physical attributes but also about maintaining the historical context and significance of the site [6].

Addressing socioeconomic inequalities is essential in heritage preservation. Historically marginalized communities often face challenges in preserving their cultural heritage due to limited resources and systemic biases. This framework advocates for an inclusive approach that empowers local communities to participate in preservation efforts. Engaging community members in decision-making processes ensures that their voices are heard, and their heritage is respected. Preservation initiatives should seek to address disparities by providing financial support and technical assistance to underserved communities [6].

Economic sustainability is another critical aspect of the framework. Preservation projects should not only focus on conserving historical assets but also on creating economic opportunities for local communities. This includes promoting heritage tourism, supporting local businesses, and developing educational programs that highlight the economic value of preserving historic sites. By aligning preservation goals with economic development within a critical pedagogical framework, such a framework may foster a mutually beneficial relationship that supports both conservation and community growth [6].

The integration of technology in preservation and curatorial practices offers new opportunities and challenges. Digital tools, such as geographic information systems (GIS) and building information modeling (BIM), can enhance preservation planning by providing detailed data on historic sites. These technologies can aid in documenting and monitoring the condition of historic resources, as well as in visualizing the impact of potential developments. However, reliance on technology must be balanced with a commitment to traditional preservation methods to ensure that digital interventions do not overshadow the authenticity of the preservation process [7].

Education and outreach are important components of effective preservation planning and curatorial management. Educating the public about the importance of historic preservation fosters a broader understanding and appreciation of heritage. Curatorial management should include programs that engage the community, raise awareness about preservation efforts, and promote a sense of shared responsibility for protecting historic sites. By building public support and awareness, preservation efforts are more likely to succeed and be sustained over time [3, 8–10].

Evaluating and revising preservation practices is also important for addressing evolving challenges and opportunities in the popular perception of material culture. Regular assessments of preservation strategies, guided by both qualitative and quantitative metrics, help ensure that practices remain effective and relevant. This dynamic approach allows for the incorporation of new research, emerging technologies, and feedback from stakeholders. Continuous improvement in preservation practices helps to balance development with conservation, maintain authenticity, and address socioeconomic inequalities in heritage preservation [3, 8–10]. This conceptual framework underscores the importance of integrating historic preservation planning and curatorial management to address the multifaceted challenges of balancing development with conservation, maintaining authenticity, and addressing socioeconomic inequalities. By adopting a holistic and inclusive approach, heritage preservationists may create preservation strategies that not only protect cultural heritage but also foster sustainable and equitable community development.

4.2 Applying Freire's critical pedagogy

Freire's critical pedagogy, with its emphasis on dialog, reflection, and empowerment, provides additional conceptual framing for addressing complex challenges in historic preservation planning and curatorial management. As provided in Appendix A, a critical-educational conceptual framework is posited in the form of a rubric that may foster the balancing of development with conservation. Applying Freire's critical lens encourages stakeholders to engage in collaborative discussions that recognize the needs of both heritage and progress. Rather than treating development and conservation as opposing forces, the adaptation of Freire's pedagogy to historic preservation and curatorial process may be a dialogic process in practice where local communities, developers, and preservationists work together to negotiate solutions that benefit

all stakeholders [1, 6]. This approach may be part of a process of empowering communities to voice their concerns about unchecked development and protect heritage sites from exploitative practices while still allowing for adaptive reuse that supports economic growth.

When applying Freire's emphasis on critical consciousness, the concept of maintaining authenticity in preservation practices becomes more than a technical exercise; it evolves into an ethical responsibility to engage with the living history of the community. Freire's notion of praxis—reflective action—calls on preservationists to constantly interrogate whose version of history is being preserved and whether the methods employed respect the cultural and historical integrity of the site. By fostering a critically reflective process through the proposed rubric (see Appendix A), preservation professionals may avoid falling into the trap of "freezing" history or erasing the dynamic nature of heritage, instead seeking to preserve the authentic spirit of a place while allowing it to evolve organically [6, 12].

In historic preservation, addressing socioeconomic inequalities should be examined. Freire's critical pedagogy highlights the importance of democratizing knowledge and power. Heritage preservation may have historically tended to favor wealthy, historically dominant groups, perhaps sometimes or often marginalizing low-income communities. Through Freire's lens, curatorial management and preservation planning should prioritize inclusive practice in which underrepresented voices are included, ensuring that preservation efforts do not reinforce historic inequalities. This means shifting from a top-down approach to a more inclusive, participatory model, where local knowledge and experience are valued equally with external experts in decision-making processes [9, 13].

Freire's idea of "problem-posing education" also applies to the way preservation planners can engage with communities [1]. Instead of imposing solutions as the default, planners and curators can create spaces for community members to express their concerns, share their historical narratives, and participate in developing preservation strategies. This participatory process is crucial in contexts where development pressures threaten vulnerable heritage sites. It allows for the creation of preservation policies that not only protect historic resources but also provide social and economic benefits to local communities, particularly those that have historically been excluded from such discussions [1, 12, 13]. When considering the roles of professional associations such as the International Council on Monuments and Sites (ICOMOS), the concept of Freire's problem-posing education may be seen as especially relevant in fostering a critical-educational conceptual framework and a rubric conceptualizing the framework for application.

Balancing development with conservation can also benefit from Freire's idea of *conscientização*, or critical awareness [1]. Communities that are made critically aware of the implications of both unchecked development and overly restrictive conservation policies are better equipped to advocate for equitable solutions [8, 10]. Through this process of critical awareness, planners can engage in deeper discussions about the long-term sustainability of heritage preservation, understanding that development does not have to come at the cost of cultural erasure. Instead, adaptive reuse and thoughtful urban planning can become tools for maintaining cultural heritage while fostering economic resilience [1, 13].

In terms of maintaining authenticity, applying Freire's critical pedagogy may also encourage the rejection of preservation practices that are overly rigid or alienating. Instead, preservation should be approached as a fluid, evolving process that respects the living cultures associated with heritage sites. This means embracing

non-traditional forms of conservation that allow for the continuing use of historic spaces by the communities that created and sustained them. By engaging with these communities through a dialogic process, curators and preservationists can ensure that the methods and goals of preservation align with the authentic needs and values of those most affected by it [1, 9].

Freire's emphasis on empowerment can significantly influence how socioeconomic inequalities are addressed in heritage preservation. Sometimes, the people most affected by heritage conservation decisions are those with the least power to influence them [8, 13]. By adopting Freire's model of empowering the marginalized through education and participation, preservation efforts can shift toward more equitable outcomes. This might involve community-driven initiatives that use heritage preservation as a tool for economic development, such as heritage tourism that directly benefits local residents or preservation projects that provide training and employment opportunities [1, 6, 13].

The concept of praxis may challenge preservation professionals to engage in ongoing reflection and action, continuously assessing the impact of their work on both cultural heritage and social justice. In the context of curatorial management, this means recognizing that every decision made in the presentation of history—whether through exhibits, restorations, or conservation policies—has ethical implications. Preservationists and curators may consider not only questions of how best to conserve the past but also questions about how their actions affect the present and future of the communities they serve. Critical questioning may help focus attention on asking questions related to the *how*, *why*, and *for whom* of historic preservation planning's goals on a case-by-case basis. By fostering a critical and reflective practice, they can ensure that their work contributes to a more just and inclusive approach to heritage preservation [1, 3, 12].

4.3 Integration with United Nations sustainable development goals

The United Nations (UN) Sustainable Development Goal (SDG) 11.4 addresses heritage preservation. Some scholars have emphasized "heritage tourism" as an important component of achieving SDG 11.4 through charging fees to the tourists that help support the preservation of historic sites through funding [14]. However, such encouragement of heritage tourism must balance the needs of the local community in ways that preserve the authentic heritage of the site. If tourism is not regulated well, it could have adverse effects on historic sites [14]. The critical-educational conceptual framework (see Appendix A) posited in this study may foster greater awareness of SDG 11.4 while also promoting critical understanding of the ethics of historic preservation planning that integrates critical pedagogy through Freire's lens.

Applying Freire's critical pedagogy to the goal of supporting the United Nations Sustainable Development Goal (SDG) 11.4, which aims to protect and safeguard the world's cultural and natural heritage, offers a framework for engaging communities in transformative ways. Freire's pedagogy, centered on dialog, conscientization, and the co-construction of knowledge, aligns with the need for inclusive, community-centered approaches in heritage preservation. His emphasis on critical reflection and action empowers local populations to not only recognize their own cultural and natural heritage but also to become active participants in safeguarding it. This is particularly crucial, as the process of heritage conservation sometimes risks being top-down, imposing external values without fully acknowledging the knowledge and priorities of the people most connected to local heritage sites [9]. The rubric posited in this study helps address this to encourage proactive assessment of heritage practices.

Freire's notion of critical consciousness can be transformative in heritage preservation efforts [1]. When communities are encouraged to reflect on their own histories, traditions, and environments through a critical lens, they are more likely to understand the complexities surrounding their heritage and the threats it faces. This awareness allows them to take ownership of both the challenges and solutions, fostering sustainable preservation initiatives. In many contexts, cultural heritage preservation has been dominated by external experts, but Freire's pedagogy invites a shift when considering cultural interaction being a type of pedagogy, emphasizing the lived experiences of local community members. As some scholars have suggested, heritage is often contested, and involving communities in decision-making processes can lead to more equitable and sustainable outcomes [4].

Moreover, Freire's commitment to dialog and the rejection of a "banking model" of education—where knowledge is deposited into passive recipients—directly challenges traditional external heritage management practices [1]. Instead of external experts dictating what should be preserved and how, a dialogic approach would encourage the exchange of knowledge between external professionals and local community members. This exchange may foster mutual learning, where both the scientific knowledge of preservationists and the lived knowledge of local communities inform decisions. Heritage is not a static entity, according to some heritage scholars, but may instead be a process of meaning-making [5]. Involving communities in this process through dialogic engagement allows for a more dynamic and inclusive understanding of heritage, which may be important for sustainable preservation.

Freire's pedagogy also promotes praxis, the combination of reflection and action, which is highly applicable to heritage preservation. Engaging communities in critically reflecting on the importance of their cultural and natural heritage encourages them to take direct action to protect it. This action, however, is not imposed from outside but emerges from the community itself, making it more sustainable and contextually appropriate. For example, local stewardship programs that encourage community members to monitor and care for heritage sites align with Freirean praxis. By fostering agency and responsibility, this approach helps to ensure long-term conservation that aligns with the community's values and practices [15, 16]. Even when those values may change in some of the ways in which they are expressed, the material culture and social interactions may still support the values in question; therefore, it may be necessary to examine from multiple viewpoints the ways in which historic sites and values are contextualized in society [11]. That context matters for how various groups and individuals interact with historic sites and what importance is placed on how historic preservation is conducted.

Freire's emphasis on the co-creation of knowledge also supports efforts to include indigenous voices in heritage preservation. Formal heritage discussions should include local community members' connection to their cultural heritage. Through critical pedagogy as operationalized in the rubric posited in this study (see Appendix A), local communities and external specialists may examine their heritage and protect their cultural artifacts in ways that are locally sustainable. This inclusion not only strengthens the cultural dynamic but also contributes to environmental sustainability, as local knowledge systems may offer valuable insights into land and resource management [16]. In this sense, Freire's critical pedagogy may help bridge the gap between cultural and natural heritage, recognizing the intertwined nature of these domains.

In applying this critical-educational conceptual framework (see Appendix A), the goal of strengthening efforts to protect and safeguard the world's cultural and natural heritage (SDG 11.4) may foster a more inclusive, dialogic, and sustainable approach to

preservation. By promoting critical consciousness, dialog, praxis, and the co-creation of knowledge, Freire's ideas may empower local communities to take ownership of their heritage and actively participate in its preservation [16]. This aligns not only with ethical principles of inclusion but also with the practical need for sustainable, community-driven heritage management. When considering SDG 11.4, engaging with local communities as active agents in the preservation process, is important for historic preservationists to try to ensure that heritage remains rooted in the local community while informed by the global importance of heritage sites.

4.4 Data trends in historic preservation planning

Data may help in identifying ways to achieve the outcomes noted in the rubric posited in this study (see Appendix A). Data on historic preservation practices, in reference to SDG 11.4, which aims to "strengthen efforts to protect and safeguard the world's cultural and natural heritage," can be measured through several metrics [17]. These include the number of heritage sites recognized under UNESCO's World Heritage List, the amount of government funding allocated to preservation efforts, and the participation of local communities in heritage conservation. As of recent reports, there are over 1200 UNESCO World Heritage Sites, and countries are increasingly adopting national policies for the protection of cultural assets [18]. For example, government spending on cultural heritage conservation has seen increases in many regions, particularly in Europe, where some nations spend approximately €2.2 billion annually on preservation efforts [19].

Further quantitative data can be found in heritage at risk indexes, which track the condition of historical sites and their exposure to threats such as urban development, climate change, and conflict. For instance, the Global Heritage Fund has identified that more than 200 sites globally are at immediate risk of destruction [20]. Such metrics are essential to SDG 11.4 because they provide a measurable way to assess the urgency and scale of preservation needs. Countries are also developing systems to assess the economic impacts of heritage tourism, which generates significant income for local economies. A recent UNESCO study found that World Heritage Sites may generate up to 40% of the tourism revenue in some regions, suggesting the financial importance of historic preservation [21].

Local and national reporting on public participation in heritage preservation is crucial for achieving SDG 11.4. Data from the World Bank has suggested that community-driven initiatives in heritage conservation are on the rise, particularly through participatory planning and the inclusion of local and historically underserved groups [22]. Increasing local communities' input into the management of preservation projects is important and reflects a shift toward inclusive governance [23]. These trends not only align with SDG 11.4's emphasis on safeguarding cultural heritage but also reveal the direct impact of preservation practices on sustainable development, particularly in terms of economic growth, social inclusion, and environmental stewardship [14, 23].

5. Recommendations and conclusions

This study posits a rubric (see Appendix A) that provides a way to address important aspects of historic preservation planning with curatorial management through a critical-educational conceptual framework. The purpose of this is to foster heritage

preservation that promotes balancing development with conservation, maintaining authenticity in preservation practices, and addressing socioeconomic inequalities. Applying Paulo Freire's critical pedagogy to historic preservation planning and curatorial management fosters a more inclusive, equitable, and reflective approach to conserving heritage. Freire's emphasis on dialog, critical awareness, and empowerment allows preservation professionals to move beyond rigid, top-down practices and engage with communities as equal partners in the preservation process. This may help balance the needs of development and conservation while helping to ensure preservation efforts remain authentic to the lived experiences and cultural practices of those most closely connected to heritage sites. By promoting participatory practices, preservationists and curators can challenge the dominance of expert knowledge and prioritize the voices of historically marginalized communities, addressing longstanding socioeconomic inequalities in the field.

Ultimately, Freire's pedagogy encourages a praxis-oriented approach, where preservation professionals continually reflect on and refine their methods in response to the evolving needs of communities and heritage sites. By integrating Freire's critical principles, historic preservation and curatorial management can become part of a process for fostering environments where heritage not only serves as a marker of the past but also as a dynamic resource that contributes to community empowerment, cultural continuity, and economic sustainability. Using this combined framework may help ensure that the preservation of heritage is not only a technical task but also a human, socially responsible practice. Without a critical-educational conceptual framework, heritage preservation may inadvertently reinforce socioeconomic inequalities or inadvertently reinforce imbalances in development that interfere with heritage conservation. By using the proposed rubric in this study, these issues may be proactively addressed to promote ethical heritage preservation.

Conflict of interest

The author declares no conflict of interest.

Appendix. Rubric for historic preservation planning that addresses balancing development with conservation, maintaining authenticity in preservation processes, and addressing socioeconomic issues in heritage preservation

This rubric has three categories and is drafted to be calculated out of 100 points. This rubric emphasizes a holistic approach to historic preservation, ensuring that development and conservation efforts are balanced, authenticity is maintained, and socioeconomic inequalities are addressed, all while integrating museum curatorial practices for public engagement and education.

A.1 Balancing development with conservation (30 points)

Focus: Harmonizing urban development, economic growth, and preservation of cultural heritage sites, while incorporating museum principles of interpretation and display for the public (**Table A1**).

Criteria	Proficient plus (3)	Proficient (2)	Approaching proficiency (1)	Does not meet standards (0)
Integration of Development and Conservation	Integrates and balances the needs of development with the conservation of heritage sites, ensuring that both are addressed without compromising cultural integrity. Incorporates museum curatorial techniques such as adaptive reuse, site interpretation, and public engagement.	Manages development and conservation reasonably well but may not fully integrate museum curatorial methods. Some aspects of development or conservation might be over- or under-prioritized.	Partial balance of development and conservation, with potential bias toward one over the other. Minimal reference to museum curation.	Does not manage the balance between development and conservation. No evidence of museum curation or planning to incorporate heritage into urban growth.

Table A1.
Criterion 1: Harmonizing urban development, economic growth, and preservation of cultural heritage sites, while incorporating museum principles of interpretation and display for the public.

A.2 Maintaining authenticity in preservation practices (40 points)

Focus: Ensuring historical integrity in preservation decisions, while applying museum standards of documentation, authenticity, and educational display (**Table A2**).

Criteria	Proficient plus (3)	Proficient (2)	Approaching proficiency (1)	Does not meet standards (0)
Commitment to Authenticity	Ensures that preservation efforts maintain the authenticity of the site or object, aligning with international conservation standards (e.g., UNESCO, ICOMOS). Curatorial methods are applied to ensure the historical narrative is accurate and effectively communicated.	Demonstrates a strong effort to preserve authenticity but may have minor discrepancies in historical accuracy or curatorial practices.	Partially maintaining authenticity, showing some gaps in adherence to preservation or curatorial standards.	Does not prioritize authenticity in preservation. Misrepresents the historical significance or overlooks museum-quality preservation standards.
Documentation and Interpretation	Thorough documentation of preservation practices, with clear curatorial narratives and interpretation plans that engage a wide audience.	Documentation and interpretation are generally sound but may lack comprehensive detail or accessibility to non-expert audiences.	Documentation or interpretation are incomplete or difficult for the general public to access or understand.	Lacks sufficient documentation and interpretation, failing to communicate the significance of the preservation effort effectively.

Table A2.
Criterion 2: Ensuring historical integrity in preservation decisions, while applying museum standards of documentation, authenticity, and educational display.

A.3 Addressing socioeconomic issues in heritage preservation (30 points)

Focus: Recognizing and addressing disparities in access to preservation resources and representation in both urban planning and museum curatorial practices (**Table A3**).

Criteria	Proficient plus (3)	Proficient (2)	Approaching proficiency (1)	Does not meet standards (0)
Inclusivity in Preservation	Actively identifies and includes marginalized or underrepresented communities in preservation planning and museum curation. Considers diverse cultural perspectives in both the preservation and interpretation of heritage.	Acknowledges the need for inclusivity and makes some effort to incorporate underrepresented voices, though may lack thorough engagement or representation.	Partially addresses socioeconomic disparities but with limited success or awareness of broader equity issues.	Ignores or overlooks socioeconomic inequalities in preservation, with little to no effort to engage marginalized communities.
Equitable Resource Allocation	Strategically allocates resources to address socioeconomic disparities, ensuring that preservation benefits are shared across all communities, with a curatorial lens that highlights these efforts in exhibitions or programs.	Makes reasonable efforts to distribute resources equitably but may overlook some key communities or areas needing attention.	Resource allocation is uneven, with little consideration for socioeconomic inequities.	Fails to address resource disparities, prioritizing affluent or already well-served areas in preservation and curation efforts.

Table A3.
Criterion 3: Recognizing and addressing disparities in access to preservation resources and representation in both urban planning and museum curatorial practices.

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Section 2

Archaeological Fieldwork and Tourism Strategies for Cultural Heritage

Chapter 7

Architectural Icons and Intellectual Beacons: Ibb City's Islamic Schools and Omar's Mosque – A Great Loss to the Islamic Heritage

Mohamed Saleh Al-Haj and Lily Filson

Abstract

The Omar Mosque and School (OMS) is a critically endangered structure. It faces imminent risk of destruction in an active warzone, which has seen the destruction already of its old minaret, although the roots of its present-day advanced state of decay through neglect extend into Ibb's political history over the course of centuries. Traditionally founded in the seventh century C.E. by Caliph Omar ibn Al-Khattab, its architecture testifies to modifications through the subsequent centuries of Yemen's dynastic history. In addition to an analysis of these phases, the proposed chapter thoroughly documents the damage of the site's components in the last century. The gathering of data in Yemen first-hand by Dr. Al-Haj through site visits and photography embodies the concept of "scholarship at the margins," especially when the Great Mosque of Ibb is juxtaposed against the well-funded rehabilitation campaigns of other monuments from the same eras of its construction; for example, Ashrafiyya in Ta'iz, Madrasa Amiriyya in Rada, and so on. Not only does the proposed paper identify the socio-political factors that have contributed to the present condition, but it also outlines for the first time an illustrated survey of the site's murals, plaster relief-work, and carved woodwork, which today call out for a similar campaign of awareness, preservation, and restoration.

Keywords: Ibb, Ibb City's Islamic schools, Islamic heritage, UNESCO failure, public policy, Yemen architecture at risk

1. Introduction

The Old City of Ibb, nestled in central Yemen, stands as a monumental testament to the intricate tapestry of pre-Islamic and Islamic architectural evolution in the region. Emerging from the shadow of its pre-Islamic roots as a fortified stronghold of the Himyarite Kingdom, Ibb evolved into a pivotal nexus of cultural, political, and intellectual exchange. Its transformation from a center of Himyarite power into a prominent Islamic hub illustrates a rich continuum of history, marked by the enduring influence of its scholarly and architectural achievements. The city's architectural

landscape, characterized by its historic mosques and schools, offers a vivid reflection of its historical and cultural significance. This chapter delves into the evolution of Ibb's architectural and scholarly significance while also addressing the contemporary challenges faced in preserving this invaluable legacy.

The Omar Mosque and School Mosque (OMS), also known as the Great Mosque/ Omri Mosque in the city of Ibb in the lower Yemeni highlands, traces its foundation to Caliph Omar ibn Al Khattab[1] (r. 634 - 644 C.E.), the second of the earliest four Rashidun Caliphates, in or around 643 C.E. in the first century of Islam. Its religious nature was manifest from its very beginning, but during the era of the Sunni Muslim sultanates who ruled Lower Yemen until the sixteenth century C.E., the OMS served as a model of educational and architectural excellence, reflecting the city's prominence as a center of enlightenment and scientific advancement. Its diverse utilities and abundant resources underscore its significance within the broader context of Ibb's architectural and educational heritage. As part of a cultural geography approach, this paper focuses on the OMS as a key element in understanding the cultural production and heritage of Ibb City.

Through a detailed examination of the OMS and its surroundings, this paper aims to elucidate the factors contributing to the city's losses and the broader implications for understanding the legacy of Islamic architecture. The intentional destructions, advanced physical decay, collapses that resulted from neglect and natural forces, as well as incidents of looting at the Great Mosque's library, all of which occurred prior to the present war ongoing in Yemen since 2015, are considered in this study in addition to the most recent damage inflicted in that current war.

2. Pre-Islamic background

The pre-Islamic Old City of Ibb in central Yemen was one of the main fortified castles of the Himyarite Kingdom, which thrived in the region from ca. 115 B.C.E. to 525 C.E. before the advent of Islam. Presently the capital of Ibb Governorate of Yemen, its ancient city was a key political and cultural hub, renowned for its historical significance, and known as the land of Dhul-Kalaa (ذو الكلاع), at least three centuries into the Islamic era. It served as a strategic link between the lands of Yahsub in Yarim, which acted as the political heart of the empire. The Himyarite kings resided in Dhofar in the north and Al-Maafer, Juban, and Yafa in the south. During this time, the area was also known as Jaafar's Region (Mikhlaf Jaafar) in honor of King Jaafar Al-Manakhi, a title it held until the ninth century A.H. or roughly the fifteenth century C.E. A perennial "green region" characterized by fertile lands and abundant rainfall, Ibb became a beacon of prosperity and growth in ancient Yemen.

In the pre-Islamic era, *Thu al-Kalaa al-Himyari*, a pre-Islamic and Islamic-era hero and one of the key figures in the Battle of Yarmouk from the regions of Habesh and Al-Sahoul, northwest of Ibb, played a pivotal role in the Islamic conquests, joining forces with other Yemeni tribes to extend their influence across the Levant, Iraq, Egypt, the Maghreb, and even parts of Europe. These tribes were instrumental in the

[1] The Great Mosque of Ibb's foundational linked to the Caliph Omar as the greatest faqih and dispenser of justice: when an ancient gold treasure was discovered on the site, dispute invariably ensued over its rightful ownership. The conflict was resolved through the Caliph Omar edict that the horde be used to construct a mosque at the site of discovery, only 24 meters from the ancient White House (See **Figure 1**).

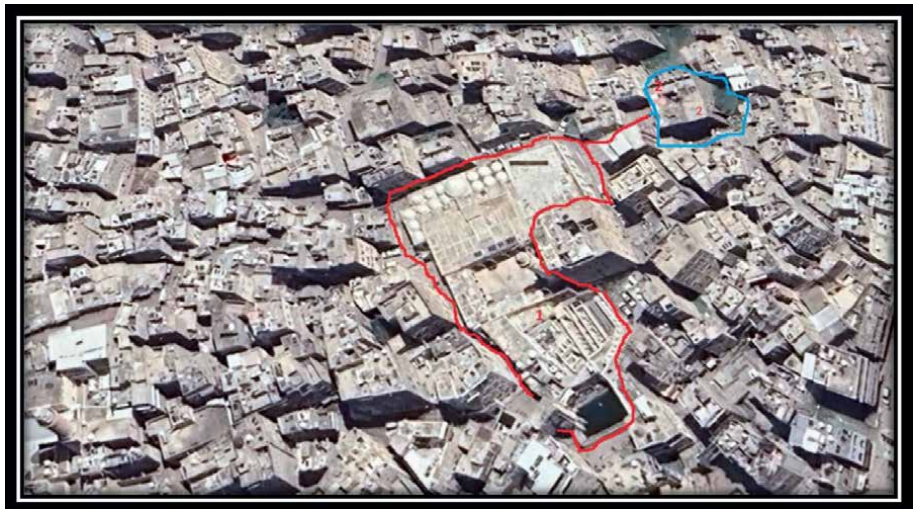

Figure 1.
Omar Mosque and school Mosque and the White House, Google-Earth August 15, 2024.

construction of new cities, leaving an indelible mark on the Islamic world. Notably, they founded the city of Fustat (now modern Cairo) in Egypt and Homs in the Levant. Their influence extended to India, Central Asia, and Europe, particularly in Spain and Portugal, where their architectural and cultural legacies can still be seen today.[2] Ibb is also home to the Hittite[3] (الحيث) of Badan mountain, east of the city. This area holds historical importance and offers a glimpse into the region's ancient past.

The initial spread of Islam to Yemen was accomplished by the companion Muadh bin Jabal (originally form Yemeni tribe of Aws and Khazraj) sent out by the Prophet Mohammed as his earliest messengers of divine message. Ibb's oldest and most prestigious mosque's foundation by the Caliph Omar (544–644 C.E.) dates to the early days of his reign as the second Islamic caliph, the administration of which was distinguished by his role as the founder of Fiqh, or Islamic jurisprudence. From its inception, the transmission of an authoritative text and its dependent practice of law-giving distinguished Islamic jurisprudence through its many subsequent centuries; though it continued to be influential in Yemen through the modern period, as one of the most important centers of transmission for not only knowledge of authoritative texts but also a refined tradition of critical and analytical thinking, which produced independently-minded judges, scholars, and revolutionaries throughout its long history.

3. Prominent figures in Ibb's Islamic history

The Old City of Ibb has been home to several notable figures who have played significant roles in Islamic history, contributing to the city's religious and

[2] See many details in Ref. [1].

[3] The Haith area is located in Badan, over Ibb city. The great warriors who are known outside Yemen. The Hittite is an ancient Himyarite tribe from Badan Mountain, Ibb. (Not *Houthi*, a recent religious group at the North of Northern Yemen). By 1340 BCE, they had become one of the dominant powers of the Middle East, originating from the area beyond the Black Sea (Encyclopedia Britannia, August 20, 2024).

intellectual legacy. To fully appreciate Ibb's impact on Islamic life, it is essential to highlight some of these key individuals, including Companions of the Prophet Mohammed ﷺ, and prominent scholars who emerged from this historically rich region. Still, the city of Ibb and its surrounding districts have produced numerous esteemed figures from the early Islamic period. Among them is Abu Qatila Murthid bin Wada'a Al-Aina, a Companion of the Prophet Mohammed ﷺ, hailing from the southern city of Wadi Anah in Al-Udayn District. Additionally, Samifa bin Al-Shaer Al-Ani, a distinguished follower, and the renowned Tabi'i Khalid ibn Ma'dan are also associated with this area. In the district of Maitam, located southeast of the city, notable figures include Baqiyya ibn al-Walid and Ka'b ibn Mat`, known as Ka'b al-Ahbar. Another prominent figure from this area is the Companion Buhair bin Saad Al-Sahouli Al-Kala'i. Further south, in the district of Dhalea,[4] figures such as Daylam bin Hosha Al-Jishani Al-Himyari, Zubaid bin Al-Harith Al-Ataqi Al-Hajri, and Hassan bin Asaad Al-Hajri have contributed significantly to Islamic history. Likewise, from the southern fringe of Jabalah, Salim bin Amer Al-Khabayer, a venerable follower who witnessed the Battle of Al-Qadisiyah, stands out. Finally, from Sahbian, the contributions of Khili Al remain integral to understanding the early Islamic influence in the region.

The city of Ibb has as well been a center for Islamic scholarship, producing numerous scholars who have left an indelible mark on Islamic jurisprudence and religious thought. Virtuous and Scholars from the People of the City of Ibb, a work written by the local Ibb scholar Abdul Wahhab bin Abdul Rahman Al Burahi (d. 904 AH), as well as another historical work Layers of the Righteous of Yemen, transmits a history, here limited to the most famous and venerable scholars who resided in this ancient city, in his book penned a history of Layers of the righteous of Yemen, transmits a history that here will be shrunken to the most famous and venerable scholars who resided in this ancient city [2]. Among the most celebrated is Yahya bin Abi Al-Khair Al-Omrani, a Shafi'i Sheikh renowned throughout Yemen for his extensive works, including the influential book Al-Bayan Sharh Al-Muhadhdhab. His legacy remains a point of pride for both Ibb and the broader region of Sahban. Another significant figure from Ibb is Imam Ahmad bin Muhammad al-Burahi, famously known as the "Sword of the Sunnah," who passed away in Ibb City in 586 A.H. (**Figure 2**). His contributions to Islamic jurisprudence and his defense of Sunni orthodoxy have solidified his place in the annals of Islamic history.

The intellectual landscape of Ibb has also been enriched by a host of other scholars and jurists, including Amr bin Hussein bin Abi Al-Nuha, Asad bin Yafar bin Salem Issa Al-Ariqi, and Abdul Rahman Al-Hassan bin Ali Amr bin Muhammad Ali Al-Riahi. Their contributions, along with those of Abu Karbin Ali Al-Radi Jaafar, Abu Abdullah Hammad Abi Bakr Al-Asbahi, and many others, have helped shape the religious and legal traditions of the region. Additionally, the works of Safi al-Din Ahmad Hassan al-Burahi, Jamal al-Din Muhammad Muhammad Hassan al-Burahi, Abdullah Muhammad bin Ali Omar al-Sarari, and Afif al-Din Abdullah bin Muhammad al-Kahili further underscore the rich scholarly heritage of Ibb. These scholars, along with figures like the reciter Taqi al-Din Amr bin Abi Bakr al-Kalali and Judge Wajih al-Din Abd al-Rahman al-Nahawani, have left a lasting legacy that continues to influence

[4] Although Ibb Governorate is the smallest and densest population area in Yemen, the ousted President Saleh in late 1990s annexed large areas to Al-Dhalea Governorate, such as the districts of Damt, Qa'taba, and Al-Oud, despite the strong opposition from the residents of these areas.

Figure 2.
Show Al-Jalalia higher school structure (closed school).

Islamic thought and practice. The jurist Taqi al-Din Amr ibn Muhammad al-Yarimi, a leading figure in the Shafi'i school of jurisprudence in Yemen, and his contemporaries, including Shihab al-Din Ahmad Mutahhar al-Himyari and Safi al-Din Ahmad ibn Muhammad Abi Bakr al-Buraih, further illustrate the depth and breadth of Ibb's intellectual contributions.

The Old City of Ibb has long been a center of Islamic scholarship and leadership, producing figures of immense historical significance. From the early Companions of the Prophet Mohammed, to the jurists and scholars who have left an indelible mark on Yemen's religious and intellectual landscape, these individuals not only shaped the spiritual and legal fabric of the region but also played a crucial role in the development of its architectural heritage. However, the legacy of Ibb's historic architecture faces significant challenges. The preservation of these ancient structures, which stand as silent witnesses to the city's rich past, is critical to maintaining the cultural and historical continuity of Ibb. The next section will examine the current state of conservation efforts in the Old City, exploring both the successes and the ongoing challenges in preserving its unique Islamic architectural heritage.

4. Architectural icons and intellectual beacons

The Old City of Ibb's architectural marvels have captivated those who have witnesses its variety and splendor over many centuries. By the end of the twentieth century, over 800 historical sites have been identified that provide a window into the past, revealing the native Yemeni artistic and architectural ingenuity from the Himyarite era through the early centuries of Islam and beyond. The stone residential towers of Ibb Old City are renowned for their unique design and construction. These towers, built from locally sourced stone, are a testament to the city's architectural prowess and ingenuity [3]. Among these, the White House (Al-Dar Al-Bayda) straddles the Himyarite and the Islamic era; though most of its oldest parts have been demolished, this site persists in local memory as the residence of the daughter of the

Figure 3.
Shows the Al-Jalalia's minaret and its surrounding exceptional architectural houses, etc.

Himyar ruler Shammar Yahri'sh (275–300 C.E.), 24 meters from OMS's eastern door as seen in **Figures 1** and **3b**).

The city of Ibb, along with its surrounding areas like Jabalah, Al-Sayyani, Al-Sahul, and Yarim, has played a pivotal role in the Islamic political, cultural, moral, human, and religious history of the region. The Old City is particularly renowned for its rich history and architectural heritage embodied by its mosques and schools. After the advent of Islam, at least 60 of these religious and educational institutions, each showcasing distinct architectural styles that reflect the city's rich Islamic heritage, were constructed in Ibb's Old City through the present.[5]

The mosques and schools of Ibb have been sustained through a well-organized system of endowments, which have been crucial in covering their operational needs. These endowments ensured the sustainability and continued service to science, religion, and the people working within these institutions. The kings and princes of Yemen, especially during the era of the Rasulid and Tahirid dynasties, showed great interest in these schools. Their patronage included substantial moral and financial support, reflecting the high respect and value placed on education and religion by Yemeni society.

Due to space limitations, this chapter will focus on a few of the most significant schools and mosques. These institutions not only highlight the architectural beauty of

[5] Encyclopedia Britannia (1983, p 125) said "The city is one of the most picturesque in Yemen; it is surrounded by a thick wall, inset with tall houses. The 60 mosques in the city are exceptionally fine and built multi-store buildings", in Al Haj [4].

Ibb but also reflect the city's historical importance as a hub for learning and culture; among them are found the Al-Nasiriya School[6] (**Figure 4a**), 11 meters from Bab Al-Nassr, north, and 11 meters from Al-Makhlatta School, south; it was also called (Higher Sanfriyah), Al-Samit School (Lower Sanfariyah), Aqeel School; Alkhadimi Schol, Al-Nadhariya School, called also Almashinah; Al-Humdhi School, the Qashmar School, Al-Kazemi SchoolAl, Al hadi School, Al-Numi School, Al-Asadiyya School, Al-Sabban School, Al-Shamsia School, Al-Badriya School, Al-Jalalia Higher School) and Al-Jalalia Lower School (**Figures 1** and **2**).

The Al-Jalalia Higher School (**Figures 1** and **2**) consists of a square base topped with a polygon embroidered with exquisite original geometric decorations and has been described as one of the most beautiful in Yemen[7]; unfortunately, it has attracted both tourists as well as controversial archaeological excavations that threaten the ruin of one of the icons of Yemeni Islamic architecture.

All of Ibb's old mosques and schools are in a state of collapse precipitated by the destructions of war or slow collapse from neglect or insufficient maintenance of the buildings. Pictured below are the School and Mosque of Imam Ahmad bin Muhammad al-Burahi, 586 A.H./ca. 1190 C.E., also called the Saif Al-Sunnah School and Mosque in deference to the memory of the jurist, scholar, and judge who became the chief scholar of the Sunnis in Yemen (**Figure 5**).[8]

Also deteriorating in plain view is the al-Nadhari School (**Figure 6a**), also called Al-Mishna School, built by Prince Jalal al-Din al-Nadhari, 800 A.H./ca. The school contains an open courtyard and a hall for lessons, as well as a mihrab, which consists of an apse framed by inscription bands. In addition to the prayer house north of the square courtyard of the school, a rectangular entrance is marked by a pointed arch opening in its southern wall. This leads to another square courtyard that contains two naves and two grooved columns surmounted by bell-shaped capitols, which

Figure 4.
(a) Al-Nasiriya school, (b) Al-Ghufra women schools, (Both sold and replaced to private houses) and (c) Albihanni school.

[6] Al-Nasiriyah School, which the Mohamed Saleh Al Haj, received his first education in late 1960s. H also learned swimming lessons in Al-Makhlatta and Samitt Schools.

[7] It attracts tourists and travels, it is described as the most beautiful minarets in Yemen (see Althour [5]). *This is Yemen*. At present, the school is being subjected to destruction for possible archology treasures.

[8] Imam Ahmad bin Muhammad al-Burahi was buried in the cemetery adjacent to the mosque, seven meters from the northern gate of the city (Bab Al-Rakza) and 109 meters from the Omar Mosque and School. At present, the site is closed with no notice, about its cemetery containing eminent scholars, jurists, and righteous men.

Figure 5.
Imam Ahmad al-Burahi's mosques and school 2024.

Figure 6.
(a) Almashinah, (b) Alkadmi; and (c) Aqeel Mosques and schools.

support the ceiling decorated with wooden arches. Also pictured are the Almashinah, Alkadmi, and Aqeel Mosques and Schools.

Of special interest among Ibb's extensive collection of mosques and schools are the Al-Ghufra الغفره, School, (**Figure 2**), Al-Numeer Schoolالنمير, and Al-huppanni School الحووبانني, which were institutions reserved for women's education that highlight the city's historically progressive approach to learning. These centers of knowledge were not only trailblazers in providing educational opportunities for women but also underscored the inclusive nature of Ibb's educational landscape.

In Ibb's historical mosques, the integration of water elements such as cisterns and pools extended beyond the Islamic ritual requirements of ablution (wudu) and purification. These water features not merely were functional but also served as vital community resources, offering a space for social interaction, communal activities, and refreshing respite from the heat of central Yemen, creating a tranquil environment that fostered both spiritual reflection and social cohesion. Moreover, these water elements became centers for practical education, where swimming lessons were conducted, as with the whole mosque and schools such as Al-Makhlata and Alsamit Schools (Al-Sanfriya), including Al-Nasiriya School, which counts the famous scholars such as Abu Muhammad al-Qasim al-Rawani, d. 608 A.H./1211 C.E.), al-Jabarti, and so on. It was also supplied with running water from the Al-Mashna

Waterwheel; it was also the location where the author learned early learning. Pools associated with mosques and schools reflect the broader Islamic tradition of valuing physical well-being alongside spiritual and intellectual pursuits. The inclusion of such facilities within the mosque complex underscored the multifaceted role of these structures in Islamic society, where architecture, environment, and community life were harmoniously integrated. This approach not only fulfilled religious obligations but also enhanced the mosque's role as a hub of communal life, contributing to the overall well-being and cohesion of the urban population in Ibb. However, historical schools that incorporated pools[9] for the community began to disappear after the mid-sixties in a wave of destruction that saw much of Yemen's historical architecture and infrastructure subsumed in favor of Western methods and styles and extremist interventions from outside Yemen.

5. Glory and ruin: The legacy of the Omar mosque and school

Foremost among the historical mosques of Ibb and also emblematic of the losses and destruction that characterize the architecture of the Old City is the Omar Ibn Al-Khattab Mosque and School (OMS), also called the Al-Jamaa Al-Kabir or the Great Mosque. Once the largest and richest educational institution in Yemen, this crown jewel of Ibb's Old City holds a prominent place in the global history of Islamic architecture, distinguished by its unique history and design.[10] It is one of the earliest and most significant mosques in Yemen, alongside the al-Janad Mosque in Taiz, the Grand Mosque in Sana'a, and the Abu Musa Al-Ash'ari Mosque in Zabid. These mosques, like the Quba Mosque in Medina—the oldest mosque in the world, reputedly founded by the Prophet Mohammed ﷺ laid himself—have continuously served religious functions since their establishment in the first century of Islam. While these other mosques are recognized as UNESCO World Heritage Sites, the OMS has yet to receive similar recognition, despite its historical and architectural significance.

The OMS is renowned for its architectural beauty, both inside and out (**Figures 7**-**9**); it was described by Abdul Wahhab Al Burahi in Layers of the Righteous of Yemen as a "Blessed Mosque" (المباركالجامع). Throughout the Islamic periods, it has undergone numerous renovations, restorations, and expansions, with the most recent major expansion occurring in the 1950s under the city's beloved ruler, Ahmed Al-Siyaghay. The layout of the mosque bears a striking resemblance to that of the Prophet's Mosque in Medina, further emphasizing its architectural importance.

The mosque's open courtyard is surrounded by corridors, with the most significant being the Qibla passage, located in the center of the mosque and covered by exquisite domes. Unique to this mosque are the vertical slabs on the Qibla wall, which serve as definitive barriers within the mosque. The structure features six main entrances and a small, spare door connected to the platform on the northern side, with the eastern entrance distinguished by its octagonal shape and domed ceiling.

[9] See **Figure 6**, C, what is left of Aqeel's swimming Pool.

[10] History dates back to the era of the second Caliph, Omar bin Al-Khattab, and it was founded by his order, and it is still called to this day. See the Yemen Historical Encyclopedia, pp. 85–86; the Yemen National Centre for Information 8/1/2018; Althurra Official Daily News 2011 [6] and Alshibani, Dhan in Yemenobserer weekly News but suspended due to the current war http://www.yobserver.com/culture-and-society/1005868.html.

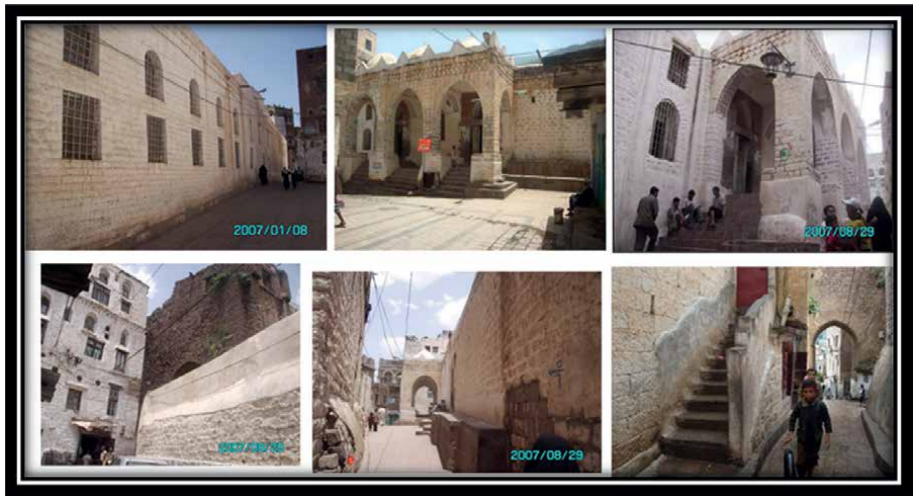

Figure 7.
Some of Omer bin Al Khattab Mosque's external views.

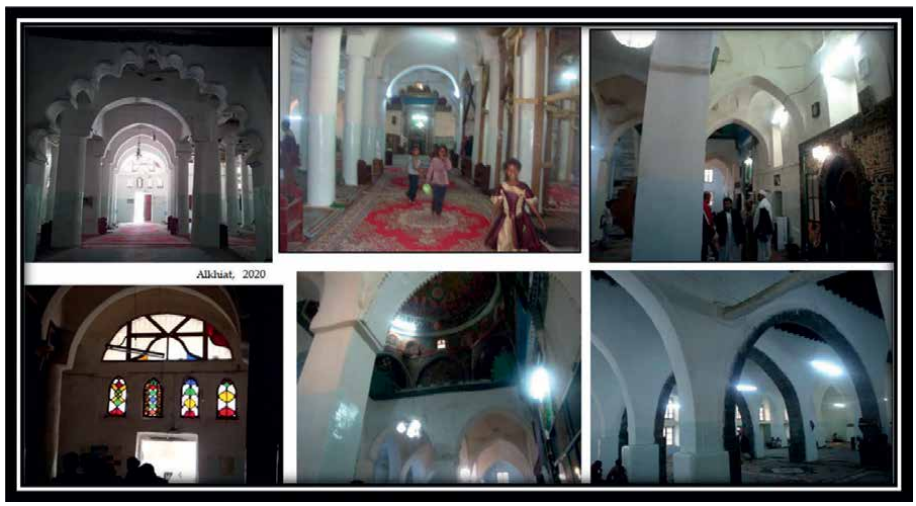

Figure 8.
Some parts of Omer bin Al Khattab Mosque's internal views.

The wide southern door, which faces the platform, leads directly to the minaret, situated in the southeast corner of the open courtyard. This courtyard, measuring 19.20 x 13.50 meters, as seen below, provides access to the mosque's watering facilities, with a swimming pool and several small basins for washing and ablution.

A large stone reservoir, measuring 12 x 14 meters (**Figure 1**), is also located in the southern part of the courtyard. There were also several connected tanks to collect, purify, and distribute the water. The first tank was attached to Jabal Badan in the vicinity of Al-Mashnna; the water once flowed from one tank to the next and so on until it reached the mosques. From there, it was distributed to the city by means of a network of wall waterwheels built on the facades of the houses, as the author remembers it in his early childhood.

Figure 9.
The Omer mosque's open courtyard.

The OMS aqueduct was a marvel of medieval engineering, featuring forty beautifully constructed arches and multiple connected tanks designed to supply the mosque's bathrooms, cisterns, and swimming pool (**Figure 10**). The aqueduct, which extended from the Al-Mashna area at the foot of Mount Baadan to the center of the OMS—a distance of 1052 meters—was founded by the jurist Shuja'uddin Omar bin Abdul Rahman Al-Nazari. He personally financed the acquisition of all the lands and houses through which the aqueduct passed, ensuring its completion. Although he did not live to see the project finished, his brother Shams Al-Din Ali Muhammad Al-Nazari completed the work, and the Emir of Ibb, Muhammad Abduh, renewed its maintenance in 1305 A.H. (1887 C.E.). The aqueduct's waterwheel, described by National Geographic as the "Wonder of Yemen",[11] was destroyed by local authorities in the mid-1960s, marking a tragic loss of Yemen's architectural heritage.

Within the Omar Mosque itself, two ancient niches (mihrabs), where the Imam leads prayers, are positioned in the middle of the mosque's prayer hall, facing the Qibla in the northern part of the mosque. These mihrabs are beautifully carved with early Islamic verses and unique inscriptions. The decorations and Qur'anic texts engraved on the mihrabs' interiors and sides are from different periods, each

Figure 10.
Ibb City's lost aqueduct: figure (a) and (b), by Mohamed Al Haj and figure (c) by Harlan Clark, National Geographic 1947.

[11] Descried by Clarck [7].

layer of writing representing a distinct time in Islamic calligraphy and decoration. Unfortunately, these artistic works have not been thoroughly studied, highlighting a need for further archaeological and anthropological research (**Figure 11**).

The ancient wooden platform (minbar) from which the Imam delivers sermons is another architectural masterpiece (**Figure 12**). It is intricately engraved with splendid inscriptions and geometric shapes, including verses from the Holy Qur'an. The platform has, however, been mistreated over time, with multiple layers of bright modern paint obscuring the details of its inscriptions, including the exact date of its creation, which is only partially visible as 800 A.H. These inscriptions and frames require careful study to uncover their full historical significance. In his 1990 book, Yemeni Decorative Arts in the Islamic Era, Rabie Khalifa [8] included an image of the Omar Mosque minbar and expressed admiration for it. However, Khalifa's appreciation appears to be somewhat limited.

Figure 11.
Omer bin Al Khattab Mosque's Mihrab.

Figure 12.
Omer bin Al Khattab Mosque's wooden Minbar.

By examining the current pulpit, he found that most of its parts were rare made of old wood. The current minbar was replaced by an old pulpit, as some of these decorations have a strong relationship with the artistic styles of the fifth century A.H. in the Dhi Ashraq Mosque in the countryside of Ibb, and the Great Mosque in Dhamar, thought to be one of the earliest known in the Islamic world, was completely destroyed, along with the approximately 12,000 objects from Yemen's pre-Islamic and Islamic past housed in the Dhamar Museum when it was targeted by an airstrike in May 2015. However, he did not address the intricate artworks and inscriptions found within the OMS, including those on the roof, walls, and interior domes. These elements, which are adorned with sophisticated artificial painting and calligraphy, were overlooked in his analysis. It is possible that Khalifa's evaluation was conducted from a distance, leading to a partial representation of the OMS's artistic and architectural significance.[12]

The walls and ceilings of the Omar Mosque are adorned with splendid decorations and colorful ancient inscriptions, featuring unique geometric and floral motifs, planets, and hexagonal shapes (**Figures 13** and **14**).

These elements, along with the numerous stone and non-stone arches supporting the roof, are covered with various decorations, inscriptions, and Quranic verses. However, these artistic elements have suffered from neglect (**Figures 13, 15** and **16**), with many of the ceiling artworks and decorations collapsing annually due to heavy monsoon rains and prolonged neglect. In 2014, the Head of the Local Council proudly stated that the ancient wooden roof was removed and replaced with new materials (**Figure 15**).

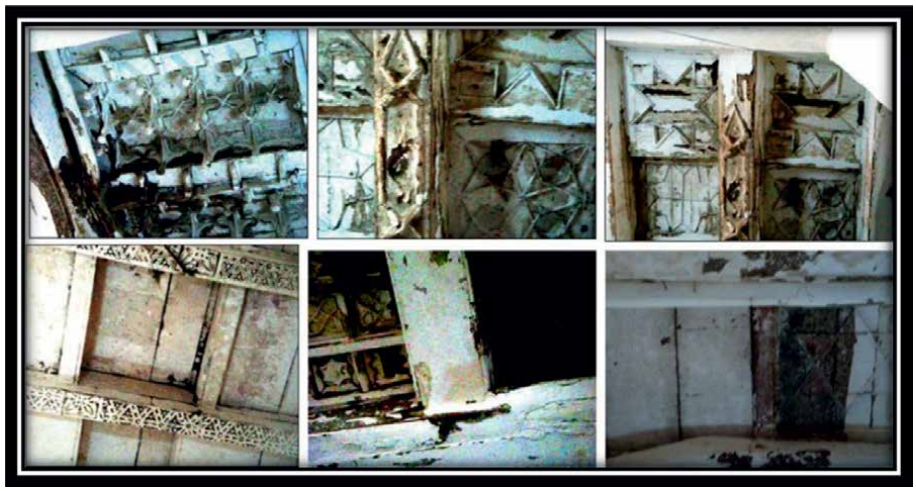

Figure 13.
Omer bin Al Khattab Mosque's wooden ceilings.

[12] With conversion Ghilan, Ghilan (August 10, 2024) the Professor of Carvings in the Department of Antiquities, Sana'a University, stated that when he was a student accompanying Prof. Khalifa on their visit in the Mid 1980s. They were panned to explore and study the art work of MOS and Ashrafiya Mosque and School in Taiz by the General Authority for Antiquities and Manuscripts in the capital Sana'a. The head of this institution is the Author of "Islamic Schools in Yemen in who deliberately ignore the school OMS and Saif Al-Sunnah Mosque and school! The book printed in Al-Risala Foundation, Beirut, Lebanon 1986.

Figure 14.
Omer bin Al Khattab Mosque's main internal wal.

Figure 15.
Omer bin Al Khattab Mosque's replaced ancient wooden ceilings.

Figure 16.
Omer bin Al Khattab Mosque's main external dooms.

Figure 17.
Omer bin Al Khattab Mosque's main internal dooms.

Further diminishing the mosque's original esthetic. The mosque's domes are held to be among the 33 oldest in Yemeni mosques, the main 16 located in the north of the mosque, while the rest are in the south and southeast (**Figures 1** and **14**).

However, the main internal dooms recent efforts to repaint the domes and ceilings with artificial colors have tarnished the distinctive esthetic value of these historical artworks (**Figure 17**). The original natural colors of the inscriptions have been lost, obscuring the unique creative features that once distinguished this edifice.

The history of the OMS minaret is marked by stages of neglect, mistreatment, and eventual destruction and rebuilding. Before its recent suspicious collapse, the minaret featured unique geometric forms and inscriptions that had withstood the test of time. Unfortunately, the antiquity and value of the minaret were not adequately recognized before its demolition. The current renovation work, completed in 2018, while noble in intent, does not replicate the original forms and details of the minaret (**Figure 18**).

The Omar Mosque and School's distinctive exterior and interior architecture provides the form for its integral role as a repository of knowledge. Once a flourishing library of invaluable manuscripts, the institution has faced significant challenges, resulting in a severe reduction of its once-celebrated collection. By the modern period in Yemen, manuscript production had become a specialized activity, consigned as artifacts to libraries or private collections, and no longer the living documents that marked the pulse of legal activity and scholarship up until the Second Ottoman

Figure 18.
Omer bin Al Khattab Mosque's collapsed minaret.

Period. With the shift to printed materials for instruction, the library, too, fell into disuse, a dusty receptacle for texts whose function had become obsolete.

The evocative pronouncement by Imam Yahya in 1925 concerning the fate of manuscripts in his own collections, "Spiders have spun their webs on them," is just as applicable to the once-vital collections of manuscript texts at Ibb [9]. The manuscripts covered a wide range of subjects, including astronomy, medicine, mathematics, agriculture, chemistry, architecture, decoration, botany, linguistics, poetry, translation, horsemanship, martial arts, literature, and Islamic studies, as well as legal documents related to Yemen's Shari'a-based contractual system. As a visualization exercise in the sheer scope of agricultural documents alone, Ibb's thousands of individually named terraces that line the adjacent mountain slopes and valleys all correspond to one (or more!) legal text. Brinkley Messick's book, The Calligraphic State, used many of the books from the library of the Great Mosque of Ibb as its primary sources and reproduced images for the first time of some of these, among them the 1896 opening pages of a register that lists endowments for the support of instruction at Ibb. The Great Mosque is also noteworthy for its collection of specific kind of Imamic official documents composed in unique spiral-form arrangement, which was replaced elsewhere in Yemen during the Second Ottoman Occupation by the duwali bookkeeping method, at which Ibb persisted in some uses through the 1940s and 1950s.

However, in addition to decay from neglect, looting at the renowned library of the OMS in recent years has reduced their present holdings dramatically. Currently, the OMS manuscript collection is reported to contain 2000 manuscripts, kept in the adjacent house of Al-Ghurbani (**Figure 13b**). By contrast, the Queen Arwa Mosque and School holds 20,000 manuscripts. The once-vital collection at Ibb's Great Mosque has been largely depleted due to looting, and many of these manuscripts were smuggled out of the country between the 1970s and 1980s.[13] Dr. Muhammad Aziz described its present state to the author: "The Ibb Great Mosque used to have a big manuscript library that was looted or taken by the government to a different location. I remember when I was a teenager that if you came from the Eastern Gate, you would find the manuscript collection hidden inside the room to your right. Some of these dated back to the first and second century of Islam.".[14] In a 2020 interview with Abdul Latef Almuealimi, the Director of the Waqf Department, it was revealed that over a thousand manuscripts, primarily focusing on religious sciences, are currently preserved in Ibb. However, these invaluable texts are at significant risk due to inadequate storage conditions. The manuscripts are housed in a room constructed from mud and gypsum, with a damp environment and no proper ventilation. This poorly maintained storage space threatens the preservation of these important religious documents, highlighting the urgent need for better conservation measures to protect this crucial aspect of Ibb's religious architectural heritage.

This loss of manuscripts has grave implications for the textual patrimony of Ibb, Yemen, and the broader Islamic world. The Great Mosque's collection, once the primary repository of Ibb's flourishing manuscript culture, is now a shadow of its former self,

[13] The author is a living witness to some stages of the open smuggling of ancient manuscripts at the Ibb-Sana'a Passenger Station at the former Al-Burg Hotel' courtyard (1970s–1980s). The ancient manuscripts (mostly large size 50–65 cm) were transported at irregular times of the month and randomly with passengers' luggage in the back trunk of Peugeot taxis by the smuggler of Indian origins known as Ahmed al-Hindi.

[14] Aziz closes with an accusation of responsibility, "The house of al-Ghurbani, neighbor of the mosque (**Figure 13b**), was in charge of this loss."

with hundreds of ancient religious and scientific texts lost to history. These manuscripts were integral to the legal and scholarly life of the region, and their loss represents a significant gap in the understanding of Yemen's architectural and cultural history.

6. The current status of the old city of Ibb's schools and mosques

The historical mosques and schools of the Old City of Ibb, Yemen, are currently in a state of advanced deterioration. This decline is primarily due to a lack of resources for their maintenance and, in some cases, deliberate closure by the Ibb Waqf Office. Notable examples include the Saif Al-Sunnah and Ahmed Muhammad Al-Barihi Schools, which have either been closed or face severe neglect. While the Omar Mosque and School (OMS) remains operational, its future as a significant cultural and educational institution is uncertain, and it risks becoming merely a memory like other historical sites in the city.

The decline of these institutions began in the 1980s when the central government in Sana'a, led by President Ali Abdullah Saleh, suspended traditional Waqf revenues. This policy shift resulted in the erosion of cultural heritage resources managed by various Waqf Departments, with funds being frozen and management rights transferred to mayors appointed by the presidency. In Ibb, a non-local mayor assumed control of the endowments previously allocated to mosques and religious sites. Prior to this policy change, the Omar Mosque in Ibb had been one of the wealthiest in Yemen, benefiting from substantial revenues from its lands and properties. The policy shift led to widespread neglect of these religious facilities, which had once served as educational centers for both the local community and visiting scholars. Historically, Ibb's mosques not only provided religious education but also offered swimming classes, calligraphy lessons, and access to valuable manuscripts. The cessation of maintenance budgets halted the salaries of students, staff, and scholars, and historic structures were replaced with inexpensive and esthetically unpleasing constructions. The Ibb Waqf Office, under the local mayor and council, was intended to safeguard the city's cultural heritage, but the overhaul of the Waqf Department had detrimental effects on other notable historical sites as well (**Figure 19**).

In 2020–2021, the southern part of OMS underwent a reconstruction project led by the head of the City Archaeology Department, supported by local businesses. However, this work was halted by the Ibb City Waqf Office, and restorations were carried out without expert consultation. The incomplete additions have unfortunately diminished the cultural heritage of the ancient OMS. In contrast, new mosques built outside the old city receive significant care from the local government, businessmen, and international donors, particularly from Wahhabi groups. These modern mosques, while equipped with full services, are characterized by their lack of traditional decoration and inscriptions. Instead, their walls are adorned with sectarian slogans imposed by the city's endowment administration as seen in mosques such as Al-Bier and Al-Noor. According to Mr. Al-Assal, the head of the Waqf Office in Ibb as of 2021, the office has implemented 15 projects to rehabilitate and expand various mosques at a cost of 300 million riyals. Additionally, 92 mosques have been supplied with integrated solar energy systems, and 3030 food baskets have been distributed to poor families, including those of martyrs and the wounded.[15] The Waqf Office has also initiated endowment investment projects, including a commercial center in Ibb

[15] Ibb Radio: January 8, 2021, https://ibbradio.com/?p=9840.

Figure 19.
Omar ibn Al Khattab Mosque, 2024.

costing 130 million riyals, with 17 additional investment projects underway at a total cost of 484 million riyals (approximately one million dollars in 2024).

The transformation of Ibb's cultural heritage—from revered spiritual sites to neglected or demolished structures—extends beyond religious buildings to include government palaces, public buildings, fortresses, and historically significant houses (**Figures 20** and **21**).

The problem, as noted by Basema Dammag in 2023, is not merely technical or artistic but primarily rooted in the political and administrative system [10]. The local

Figure 20.
Demolishing and replacing Ibb City's historically houses.

Figure 21.
Neglecting and demolishing Ibb City's significant architectural public buildings and fortresses.

authority's failure to address the preservation of Ibb's heritage highlights a deeper issue within the governance and management of the city's cultural assets.

7. Conclusion

The architectural heritage of Ibb, with its remarkable blend of pre-Islamic fortifications and Islamic structures, represents a significant chapter in the broader narrative of Islamic architecture. From the ancient Himyarite castles to the grand mosques and scholarly institutions of the Islamic period, Ibb's buildings narrate a story of cultural and intellectual prominence. However, this rich heritage is now under severe threat from neglect, conflict, and inadequate conservation efforts. The decay and loss of historic structures, coupled with the diminishing manuscript collections, underscore the urgent need for a concerted effort to preserve Ibb's architectural and scholarly legacy. As the chapter has explored, the preservation of Ibb's architectural marvels is not merely an act of maintaining physical structures but also a crucial endeavor to safeguard the cultural and intellectual heritage that has shaped the city's historical identity. Addressing these challenges with effective conservation strategies and renewed appreciation for Ibb's historical significance is imperative for ensuring that this vibrant legacy endures for future generations. The principle adopted by UNESCO that the "deterioration or disappearance of any item of the cultural or natural heritage constitutes a harmful impoverishment of the heritage of all the nations of the world" drives the present paper's exposition of the current state of the oldest mosque in Ibb with the hope that a campaign of preservation and restoration, on the model of those undertaken at the Ashrafiyya in Ta'iz, the juban Great Mosque in Ald Dali, and the Amiriyya in Rada,' may yet await the Great Mosque in the future.

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Chapter 8

Enhancing Educational and Tourism Strategies at Heritage Sites: Visitor Flow Prediction Using ARIMA and Autoregressive Models

Pablo Rosser and Seila Soler

Abstract

This study focuses on the use of ARIMA and Autoregressive (AR) models to predict visitor flow to Civil War shelters in Alicante, highlighting seasonal patterns and differences among various visitor groups, with an enriching approach toward educational and tourism applications. Through a retrospective longitudinal design covering from August 2023 to January 2024, it analyzes the time series of visits, differentiating between the general public and school groups, as well as examining geographical demand. The research emphasizes the effectiveness and simplicity of the ARIMA(0, 0, 0) model with logarithmic transformation in modeling time series, while the AR(6) model proves indispensable for capturing short-term temporal dependencies. Despite the usefulness of these forecasts for future planning, the existence of uncertainties highlights the importance of adopting flexible management approaches and incorporating additional variables to refine predictions. This approach not only improves the management of visitor flows but also significantly contributes to the creation of more effective educational and tourism strategies, promoting the sustainability and appreciation of cultural heritage.

Keywords: cultural heritage, ARIMA models, autoregressive, visitor prediction, heritage sites

1. Introduction

In scientific terms, autocorrelation refers to the quantification of the linear interdependence between successive observations of a time sequence, comparing current instances to their counterparts in previous intervals, known as lags. A high magnitude of autocorrelation suggests that historical observations exert a significant influence on contemporary values. As the temporal distance between compared observations increases—that is, the number of lags—the magnitude of autocorrelation tends to decrease, though these values remain statistically significant ($p < 0.001$). This characteristic is common in time series analysis, indicating that even at extended

temporal distances, there is a non-random linear correlation between successive observations [1–4].

The ARIMA (AutoRegressive Integrated Moving Average) model is a statistical model used to analyze and predict time series. It is capable of capturing a range of standard patterns in temporal data for future projections. ARIMA combines three basic components: autoregressive models (AR), integrated differentiation (I), and moving averages (MA) [5, 6].

The ARIMA model is an essential analytical tool for forecasting and analyzing time series, consisting of three key elements: Autoregressive (AR) p, Integrated (I) d, and Moving Average (MA) q. The AR p component captures the relationship between an observation and its past values, basing the prediction on the historical behavior of the series. "p" represents the number of past observations considered. The I d component focuses on the differentiation of the time series, essential for achieving stationarity, a condition where the statistical properties of the series, such as mean and variance, remain constant. "d" indicates the degree of differentiation needed. The MA q component models the error in the prediction from a combination of past errors, allowing for the capture of unexpected temporal variations. "q" refers to the number of error terms incorporated into the model.

Determining the optimal parameters for p and q is performed through the analysis of autocorrelation (ACF) and partial autocorrelation (PACF) graphs. These graphs are fundamental for identifying the appropriate structure of the ARIMA model, allowing the determination of the necessary number of AR and MA terms by observing significant correlation bars outside the confidence zones, thereby adjusting the model to accurately reflect the analyzed time series dynamics.

1.1 Research objectives

The general objective of the research is to analyze and predict the influx of visitors to memorial cultural heritage through the application of ARIMA and autoregressive statistical models, to better understand and manage the impact of visits to the Civil War shelters in Alicante.

Specific objectives

1. Investigate the variability in attendance at the shelters between August 2023 and January 2024 to identify seasonal patterns and peaks of visits.

2. Examine differences in visit frequency between the general public and school groups, highlighting distinct preferences and typologies.

3. Analyze the geographical distribution of interest in the shelters to locate areas of high demand at various levels.

4. Apply ARIMA and AR models to represent the dynamics and temporal dependencies of visits.

5. Use statistical models to project future visitor influxes, assessing accuracy and associated uncertainty.

6. Implement unit root tests, such as Dickey-Fuller, to verify stationarity and determine the need for time series differentiation.

7. Compare ARIMA and AR models based on their simplicity, relevance of coefficients, and predictive efficacy to choose the most suitable one.

8. Study autocorrelations and partials to understand the influence of past values on future ones and adjust the relevant model.

9. Future Forecast Evaluation: project short-term visitor influx using the selected model, as a tool for planning and decision-making.

10. Contrast the models in terms of accuracy and reliability of forecasts through statistical indicators and confidence intervals, for their validation.

11. Suggest the incorporation of new data and variables, as well as the exploration of other models, to enrich the analysis and improve the accuracy of predictions.

2. Methodology

This quantitative study examines the influence of visits to the Civil War shelters in Alicante on memorial cultural heritage. Using a retrospective longitudinal design, it analyzes data from August 2023 to January 2024, focusing on two groups of visitors: the general public and school groups. Participants total 406 individuals, both local and international, who have made reservations through electronic and telephone means.

The data collection methodology was based on a visitation record, which includes information about the date, type, and origin of visitors, and their knowledge of the shelters. This information was systematized by the managing company, providing a representative sample throughout different seasons, though not throughout the entire year.

Data have been analyzed quantitatively with SPSS Statistics v29.0.1.0, R Studio, and Python, applying statistical models including ARIMA, autoregressions, and autocorrelations, to detect patterns and predict trends. Models were selected based on their complexity and significance.

The study complies with ethical principles, ensuring informed consent and data confidentiality. However, it suffers from temporal limitations by not covering a full year, which may affect the generalization of the results.

3. Results

First, descriptive and statistical analyses were performed to gain as comprehensive a view as possible of the niche of work where the study was to be conducted, which for lack of space we do not include in depth in this publication.

Subsequently, in the analyses, three statistical models were used indiscriminately: ARIMA(1, 0, 1), ARIMA(0, 0, 0) with logarithmic transformation, and AR(6), evaluating their capacity to model and predict trends in visits to the shelters. The selection of the optimal model was based on simplicity, the significance of coefficients, and the capacity to capture the temporal dynamics of visits. The ARIMA(0, 0, 0) model with logarithmic transformation was identified as the most suitable for the analyzed time series, providing an optimal balance between simplicity and forecast

accuracy. However, the utility of the AR(6) model to capture significant short-term dependencies is recognized. The choice of model considered the specific nature of the data and the objectives of the analysis.

3.1 Prediction of visitor influx through ARIMA (autoregressive integrated moving average) and autoregressive models

3.1.1 Prediction by date of visit through the ARIMA model

We conducted an analysis of the autocorrelations of the time series corresponding to the "Date of the visit." Autocorrelations measure the linear relationship between the current values of a time series and its previous values (lags). High autocorrelation indicates that past values have a strong influence on current values.

The time series exhibits significant autocorrelations for the first 16 lags, indicating strong temporal persistence; that is, visits are highly dependent on their previous values. The values of autocorrelation decrease as the number of lags increases but remain significant ($p < 0.001$), which is common in time series data.

Indeed, the autocorrelation values are high for the initial lags, starting at 0.737 for the first lag and gradually decreasing to 0.631 by the sixteenth lag. This suggests that visits on a given day are strongly influenced by visits on the preceding days (**Table 1**).

The fact that autocorrelation values decrease slowly and remain positive for all considered lags indicates persistent time series behavior. This means visits tend to follow a "memory" of their past behavior over time.

The Ljung-Box statistic values are very high and significant (less than 0.001), indicating that the autocorrelations for each of the lags are not zero, and, therefore, there is a significant temporal dependence structure in the series of visits.

Partial autocorrelations, which show the correlation between two time points with the influence of the intervening points removed, decrease more rapidly than simple autocorrelations. This may indicate that the direct effect of previous values fades more quickly than the total effect.

Indeed, the partial autocorrelation is high for the first lag and then decreases rapidly, becoming insignificant from the thirteenth lag onward. This is characteristic of an autoregressive (AR) process, where previous values affect future values up to a certain point, and then the influence stabilizes.

The high autocorrelation in the initial lags means that recent values in the series have a significant influence on future values.

The significance of partial autocorrelations for the first lag implies that an AR(1) model could be appropriate for the data. However, the partial autocorrelations do not fade completely to zero at higher lags, indicating a more complex AR model or the presence of other dynamics in the series (**Table 2**).

In the following figures, autocorrelation and partial autocorrelation are visually represented at different lags, illustrating the strong temporal persistence and the direct effects of past values on future values of the time series data (**Figure 1**).

Based on the provided data from the Autocorrelation Function (ACF) and Partial Autocorrelation Function (PACF), some possible conclusions can be drawn:

- The ACF value at lag 1 is very high (0.737), indicating a strong positive correlation between each observation and the next in the series. This suggests that the data may be non-stationary, as there is persistence of values over time.

Series: Date of the visit					
			Ljung-Box Statistics		
Lag	**Autocorrelation**	**Standard Error[a]**	**Value**	**gl**	**Sig.[b]**
1	.737	.050	222.925	1	<.001
2	.729	.072	441.251	2	<.001
3	.722	.088	655.875	3	<.001
4	.714	.101	866.207	4	<.001
5	.706	.113	1072.479	5	<.001
6	.699	.123	1275.550	6	<.001
7	.693	.133	1475.332	7	.000
8	.686	.141	1671.845	8	.000
9	.680	.149	1865.066	9	.000
10	.672	.157	2054.393	10	.000
11	.664	.164	2239.816	11	.000
12	.656	.170	2421.144	12	.000
13	.648	.176	2598.367	13	.000
14	.641	.182	2772.341	14	.000
15	.636	.188	2943.981	15	.000
16	.631	.193	3113.288	16	.000

[a]*The underlying process assumed is MA with the order equal to the number of lag minus one. Bartlett's approximation is used. b. Based on the asymptotic chi-square approximation.*
[b]*The underlying process assumed is MA with the order equal to the number of lag minus one. Bartlett's approximation is used. b. Based on the asymptotic chi-square approximation.*

Table 1.
Autocorrelations.

- ACF values show a gradual decrease as lags increase but remain significant up to lag 16 (all significant at $p < 0.001$). This slow decay evidences a possible long-memory process or that the series could be integrated of a certain order (I(d)), meaning it may be necessary to differentiate the data d times to achieve stationarity.

- The PACF is also significant at lag 1 and decreases afterward. This may indicate an AR(1) process, where the current value is significantly influenced by the immediate previous value.

- The PACF after lag 1 shows non-significant values (except for lags 15 and 16, which have small but significant autocorrelations), meaning it may not be necessary to include additional AR terms.

- Patterns in ACF and PACF are often used for model identification in time series analysis. In this case, ACF and PACF suggest that an ARIMA model could be appropriate. Specifically, given the slow decay of ACF, an ARIMA model with differentiation might be needed to account for non-stationarity.

Series: Date of the visit		
Lag	**Partial Autocorrelation**	**Standard Error**
1	.737	.050
2	.406	.050
3	.271	.050
4	.192	.050
5	.142	.050
6	.111	.050
7	.087	.050
8	.069	.050
9	.054	.050
10	.039	.050
11	.028	.050
12	.018	.050
13	.010	.050
14	.010	.050
15	.014	.050
16	.015	.050

Table 2.
Partial Autocorrelations.

In summary, the data likely require some form of differentiation to achieve stationarity, and an AR(1) process could be a good starting point for modeling. However, further analysis, such as unit root tests (e.g., augmented Dickey-Fuller test), is needed to confirm non-stationarity and the required order of differentiation, and model fitting with diagnostic checking would be needed to select the final model.

Given the prior analysis of autocorrelations, a reasonable starting point for the ARIMA model could be \(p = 1\), \(d = 1\), and \(q = 1\), adjusting as necessary based on model diagnostics.

We will use an augmented Dickey-Fuller test to assess the time series' stationarity and determine if it is necessary to differentiate the series to make it stationary (**Table 3**).

Since the p-value is significantly less than 0.05, and the test statistic is lower than the critical values for common confidence levels (1%, 5%, and 10%), we reject the null hypothesis that the series has a unit root and conclude the series is stationary. This means it is not necessary to differentiate the series to achieve stationarity, suggesting \(d = 0\) might be appropriate for the ARIMA model.

Now, we will construct an ARIMA model with the initial parameters suggested by the prior autocorrelation analysis, adjusting \(d = 0\) based on the outcome of the Dickey-Fuller test (**Table 4**).

The evaluation of an ARIMA(1, 0, 1) model applied to time series data shows that, although the AR and MA terms are not statistically significant, the absence of autocorrelated residuals indicates that the temporal structure is well represented. However, the lack of normality in the residuals could signal omissions in capturing

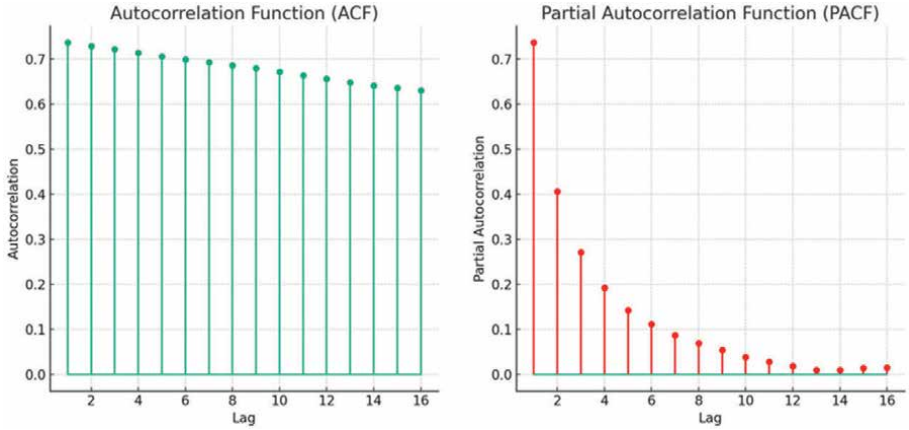

Figure 1.
Autocorrelation function (ACF) and partial autocorrelation function (PACF) graphs based on the provided values.

Augmented Dickey-Fuller test for the time series of the number of visitors	
Test Statistic	−7.687
p-value	(1.45×10^{-11})
Used Lag	0
Number of Observations Used	95
Critical Values	Para un nivel de confianza del 1%, −3.501; para el 5%, −2.892; y para el 10%, −2.583.

Table 3.
Dickey-Fuller Test.

the data's dynamics. The implementation of logarithmic transformations improved the log-likelihood and information criteria (AIC and BIC), though the AR and MA terms remain non-significant. This suggests that a more simplified model might be appropriate.

The improvement in the normality of the residuals following transformation is evidenced in the Jarque-Bera test, with skewness and kurtosis closer to those of a normal distribution, and a p-value that does not reject the hypothesis of normality. Despite the improvement in the distribution of residuals, the insignificance of the AR and MA coefficients points toward considering a more simple model, like an ARIMA(0, 0, 0) with a constant, which would assume a constant mean in the series.

Before adjusting a simpler model, the seasonality in the transformed series should be examined through visual analysis. If no seasonal patterns are detected, a simplified non-seasonal model could proceed. Preliminary visual analysis reveals no evident seasonality, which could justify the use of a simplified non-seasonal model (**Figure 2**).

Given the lack of clear visual evidence of seasonality and the non-significant coefficients in the ARIMA(1, 0, 1) model for the transformed series, exploring a simpler model seems reasonable. We will adjust an ARIMA(0, 0, 0) model with a constant to the transformed series as a starting point for comparing model complexity. This approach will allow us to assess whether a model that assumes a constant

Coefficients	Comments
const: 4.2312 (p-value <0.001),	Indicating the constant term is significantly different from zero.
ar.L1: 0.2777 (p-value = 0.585)	Showing the autoregressive coefficient is not significantly different from zero at the standard confidence level.
ma.L1: −0.0638 (p-value = 0.911)	Indicating the moving average coefficient is also not significantly different from zero.
The Log Likelihood es −250.581	Additional information.
The information criteria AIC and BIC are 509.162 and 519.420, respectively	Additional information.
The Ljung-Box test for autocorrelated residuals shows a p-value of 0.99	Indicating there is no evidence of autocorrelated residuals in the model..
The Jarque-Bera test yields a p-value of 0.00	Suggesting the residuals do not follow a normal distribution, which could be an area for investigation and improvement.

Table 4.
The adjusted ARIMA(1, 0, 1) model for the time series of the number of visitors.

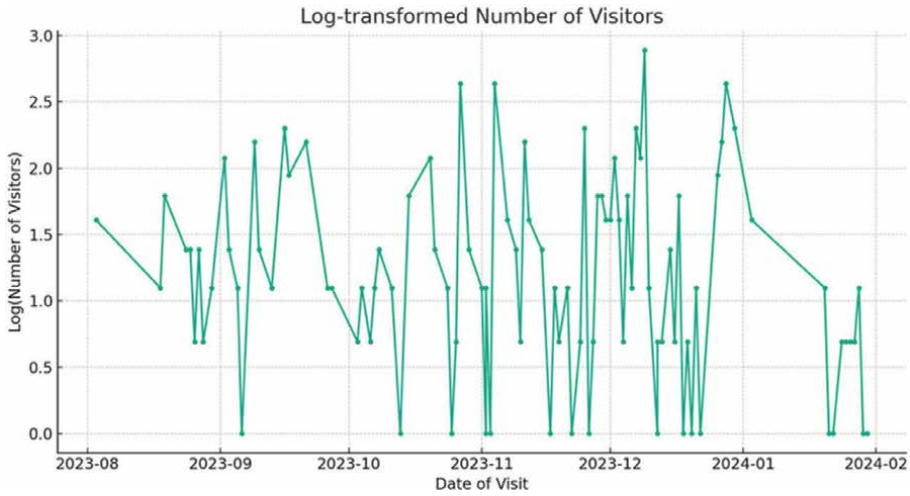

Figure 2.
The graph on a time series transformed via logarithm.

mean is sufficient to capture the dynamics of the time series, based on criteria such as the AIC, BIC, and the significance of the model parameters, as well as the normality of the residuals. The ARIMA(0, 0, 0) model fitted to the time series transformed through logarithm (essentially modeling the series as a constant mean) provides the following results: the Log Likelihood is −109.429, with an AIC of 222.858 and a BIC of 227.987, which is slightly worse than the ARIMA(1, 0, 1) model in terms of AIC and BIC, but the difference is minimal. The coefficient for the constant is significant (p-value <0.000), indicating that a constant mean is a significant component of the model. The Jarque-Bera Test for Residuals: skewness (Skew): 0.069, indicating a symmetric distribution of residuals. Kurtosis: −0.708, suggesting a less pronounced distribution of residuals compared to a normal distribution. The Jarque-Bera test now shows a p-value of 0.33, indicating that there is not enough evidence to reject

the hypothesis of normality in the residuals. The fit of the ARIMA(0, 0, 0) model to the transformed series suggests that a simple model, which considers a constant mean, is sufficiently good for modeling this time series, based on the model selection criteria and the normality of the residuals. This suggests that additional complexity through AR or MA terms may not be necessary for this particular time series. The absence of significant seasonal terms, both in visual inspection and in the fit of the simple model, suggests that there is no clear seasonality in the data that requires a SARIMA model. We have used the ARIMA(0, 0, 0) Model with a logarithmic transformation for the next 5 periods, adjusted to the time series transformed through logarithm, and they are constants, with an approximate value of 3.199 on the logarithmic scale. When transforming these values back to the original scale, this suggests an expected number of visitors that reflects the constant mean modeled by the ARIMA(0, 0, 0) (**Table 5**).

The confidence intervals for these forecasts on the original scale range from approximately 0.726 to 14.091 visitors. These wide intervals reflect the inherent uncertainty in future forecasting based on a model of constant mean (**Figure 3**).

These forecasts and their confidence intervals provide an estimate of the number of visitors expected in the next five periods, based on the historical trend modeled and assuming a constant mean. The wide range of the confidence interval

	Forecast	Lower CI	Upper CI
96	3.198985	0.726242	14.09105
97	3.198985	0.726242	14.09105
98	3.198985	0.726242	14.09105
99	3.198985	0.726242	14.09105
100	3.198985	0.726242	14.09105

Table 5.
Visitors according to the ARIMA(0, 0, 0) Model with a Logarithmic Transformation.

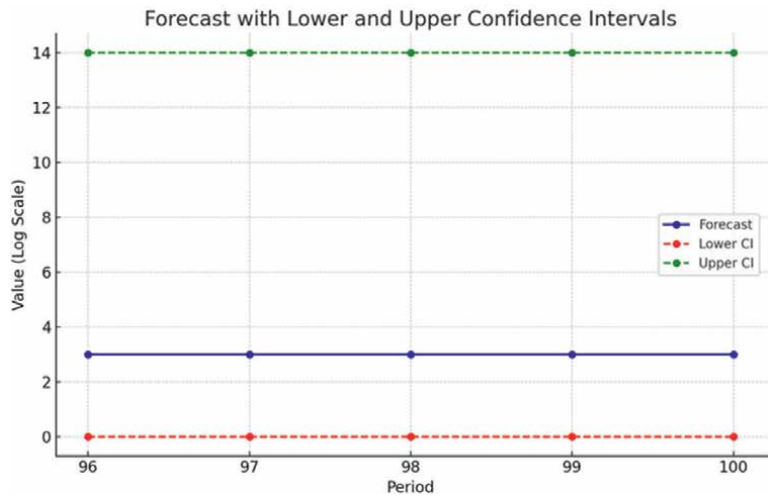

Figure 3.
Graph on confidence intervals based on a model of constant mean.

underscores the potential variability in the forecasts and highlights the importance of considering this uncertainty when planning or making decisions based on these forecasts.

3.1.2 Prediction through the autoregressive model (AR) of order 6

Based on the information from partial autocorrelations that we have obtained, it seems that an autoregressive model (AR) of order 6 might also be suitable for modeling the time series of visits to the civil war shelters in Alicante. The significant partial autocorrelation up to lag 6 suggests that past values up to six periods back have a significant influence on the current value of the series.

An AR(6) model will attempt to predict the current value of the series as a linear combination of the previous six values. This type of model is suitable when the time series shows a clear dependency on its past values up to a certain point, as indicated by the significant partial autocorrelations up to lag 6 (**Table 6**).

We will proceed to construct and estimate an AR(6) model for the time series. This model will be adjusted to the data to better understand the temporal dynamics of visits to the shelters and to make future forecasts based on historical information (**Table 7**).

	Coefficient
0	4.113207
1	0.237784
2	0.037871
3	−0.17917
4	0.061418
5	−0.16254
6	0.040825

Table 6.
Coefficients according to the autoregressive model (AR) of order 6.

Coefficients	**Comments**
const: 4.1132 (p-value <0.001)	Indicating a baseline level of visitors.
ar.L1: 0.2378 (p-value = 0.024)	Indicating that the most recent value has a positive influence on the current value of the series.
The other lags (L2, L3, L4, L5, L6) have coefficients that are not significantly different from zero at the standard confidence level	Although L3 and L5 show some level of negative influence.
The Log Likelihood is −234.416.	Additional information
The AIC and BIC information criteria are 484.833 and 504.831, respectively	Which can help compare this model with other potential models
The S.D. of the innovations is 3.273	Providing a measure of the variability of the model's errors

Table 7.
Coefficients according to the model (AR) 6.

The AR(6) model indicates that there is a significant dependency on the most recent value of the time series to predict the current value. However, the significance of the other lags is limited, suggesting that the influence of the previous values beyond the immediate one may not be as strong as initially expected.

This graph (**Figure 4**) will show the magnitude and significance of each lag coefficient (L1 to L6), which will help visualize how each past value contributes to the current value of the time series.

Based on the partial autocorrelation, an AR model could be suitable for this time series. The last significant lag based on partial autocorrelation is lag 6, suggesting that an autoregressive (AR) model of order 6 might be suitable for the time series of visits to Civil War shelters in Alicante (**Table 8**).

The unit root test (ADF Test) indicates that the time series of visits is stationary, as the p-value is less than 0.05 (p-value = 1.45e-11), allowing us to reject the null hypothesis of a unit root.

The model selection process based on the AIC criterion suggests that the best autoregressive model for the data on visits to the Civil War shelters in Alicante is also an AR(6), which is the same as initially identified with the partial autocorrelations.

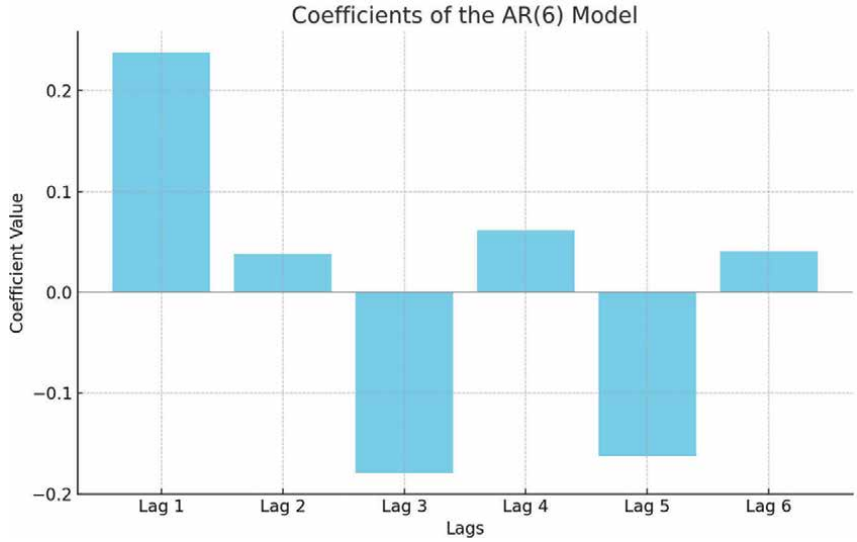

Figure 4.
Graph to visualize the coefficients of the autoregressive model (AR) of order 6 obtained in the last analysis.

	Real	Imaginary	Modulus	Frequency
AR.1	1.2714	−0.0000j	1.2714	−0.0000
AR.2	0.3843	−1.5299j	1.5775	−0.2112
AR.3	0.3843	+1.5299j	1.5775	0.2112
AR.4	−1.0748	−0.9190j	1.4141	−0.3874
AR.5	−1.0748	+0.9190j	1.4141	0.3874
AR.6	3.8718	−0.0000j	.8718	−0.5000

Table 8.
Coefficients for the (AR) 6 model; time series of visits.

The constant (intercept) and the first lag (L1) are significantly different from zero, indicating that they have a statistically significant influence on the model. The other lags are not statistically significant at the 95% confidence level, although lag 3 is close to the significance threshold (p-value = 0.095).

The intercept of 4.1132 suggests that, in the absence of previous visits (i.e., when all lags are zero), the model predicts a base number of approximately 4 visitors. This value is statistically significant, as indicated by the p-value less than 0.05 (**Table 9**).

The Coefficients of the Lags are as follows:

- Number of Visitors – L1: The coefficient of 0.2378 for the first lag indicates that visits on the previous day have a positive relationship with the current visits. For each additional visitor on the previous day, we would expect to see an increase of approximately 0.2378 visitors on the current day. This effect is statistically significant.

- Number of Visitors – L2 to L6: The coefficients for lags 2 to 6 vary in magnitude and direction, but except for lag 3, none of them are statistically significant at the 95% level. This suggests that the influence of previous visits on current visits decreases or becomes less predictable after the first day.

The standard deviation of innovations (model errors) is 3.273, which gives us an idea of how much the actual observations vary around the model's predictions.

The AIC (4.822) and BIC (5.048) values are criteria used to compare models. In this context, they only provide an internal reference, as we are not comparing this model to others.

The roots of the characteristic polynomial indicate the stability of the model and the temporal dynamics of the series. All roots are real or pairs of complex conjugates with moduli greater than 1, suggesting that the model is stable. The pairs of complex conjugates imply oscillations in the time series, but the presence of dominant real roots suggests that these oscillations are not the main component of the series dynamics.

The AR(6) model suggests that visits to the Civil War shelters in Alicante are significantly influenced by the previous day's visits, but visits from more distant previous days have a lesser or uncertain effect on current visits. This might imply that promotional campaigns or special events would have a more immediate impact on visits that would dissipate relatively quickly.

	coef	**std err**	**z**	**P > |z**	**[0.025**	**0.975]**
intercept	4.1132	1.064	3.865	0.000	2.027	6.199
Number of Visitors.L1	0.2378	0.106	2.249	0.024	0.031	0.445
Number of Visitors.L2	0.0379	0.107	0.352	0.725	−0.173	0.249
Number of Visitors.L3	−0.1792	0.107	−1.668	0.095	−0.390	0.031
Number of Visitors.L4	0.0614	0.107	0.573	0.567	−0.149	0.271
Number of Visitors.L5	−0.1625	0.107	−1.514	0.130	−0.373	0.048
Number of Visitors.L6	0.0408	0.107	0.383	0.702	−0.168	0.250

Table 9.
Coefficients for the (AR) 6 model.

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However, the limited significance of lags beyond the first suggests that other factors not captured by this model might be influencing visits, warranting further investigation that could include external variables or considering different types of models.

3.1.3 Future forecasts

The AR(6) model can be used to make future forecasts, taking into account the significant influence of the first lag and the model's stability. Making forecasts will involve using the last 6 observed values to predict future values, iterating the process for each step forward in time that we wish to forecast.

The results seem to be consistent and provide a solid basis for decision-making and planning based on the forecasts generated by the model. However, as always, it is prudent to consider the inclusion of additional data or the exploration of other models to validate these findings and improve the accuracy of the forecasts.

To make future forecasts using the AR(6) model, we will specify the number of future periods we wish to forecast. Let us assume, for example, that we want to make forecasts for the next five future periods. We will use the AR(6) model we have previously adjusted to generate these forecasts (**Figure 5**).

Let us proceed to make and visualize these forecasts (**Table 10**):

The chart (**Figure 6**) displays future forecasts for visits to the Civil War shelters in Alicante, using the autoregressive model of order 6 (AR(6)). Historical data are presented in green, while future forecasts are shown in red.

The AR(6) model projects future visits by focusing on immediate autocorrelation and model stability. Useful for resource management, it allows for demand forecasting and facilitates decision-making. However, inherent uncertainty and confidence limits should be considered, and forecasts could be refined with more data or alternative models.

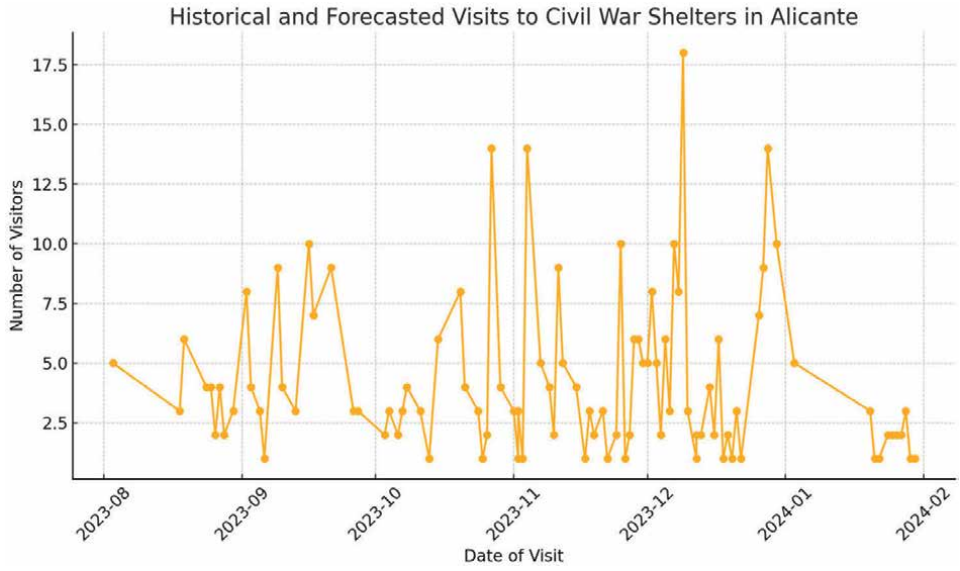

Figure 5.
The graph shows the historical data of visits to the Civil War shelters in Alicante and the future forecasts generated by the AR(6) model.

	0
2024-01-31	3.730753
2024-02-01	4.799849
2024-02-02	4.872107
2024-02-03	4.806394
2024-02-04	4.688019

Table 10.
Forecasts by Date and Number of Visitors.

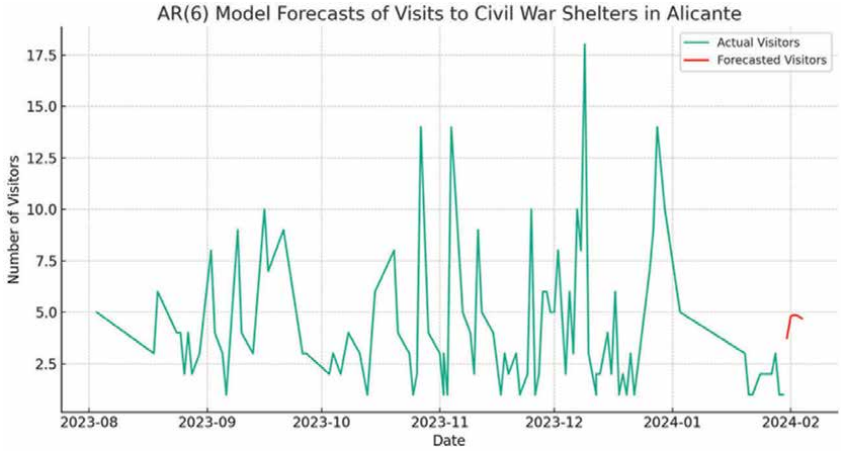

Figure 6.
Future forecast chart for visits, using the autoregressive model of order 6 (AR(6)).

3.2 Choosing a model: comparisons

As verified, we have used various models to analyze future forecasts, the forecasts on visits to the shelters in the city of Alicante.

The ARIMA(1, 0, 1) aims to capture autoregression and moving average in the time series, indicating complex temporal relationships. However, the non-significance of its AR and MA coefficients questions its necessity. Alternatively, the ARIMA(0, 0, 0) with logarithmic transformation represents the series through a constant mean, suitable for stationary series as confirmed by the Dickey-Fuller test, and seeks to stabilize the variance. This simple model does not show significant residual autocorrelations, suggesting an effective capture of the temporal dependency structure without additional components. It provides forecasts based on the stability of the mean, albeit with some uncertainty reflected in the confidence intervals.

The choice between these two models depends on the desired balance between simplicity and the ability to capture complexities in the data. The ARIMA(0, 0, 0) with logarithmic transformation appears to be sufficient and more parsimonious for modeling the given time series, reflecting the "less is more" philosophy in statistical modeling.

The significance of the constant in the ARIMA(0, 0, 0) model suggests that, for this particular time series, the additional complexity of AR or MA terms may not be necessary.

The adequacy of the model should be evaluated not only in terms of statistical fit but also in its ability to produce accurate and useful forecasts. The simplicity of the ARIMA(0, 0, 0) model, along with the normality of residuals, makes it preferable for interpretation and practical application in this case.

The ARIMA(1, 0, 1), ARIMA(0, 0, 0) with logarithmic transformation, and AR(6) models differ in complexity and approach for analyzing visits to the Civil War shelters in Alicante. ARIMA(1, 0, 1) seeks to capture short-term dependencies, while ARIMA(0, 0, 0) simplifies the series to a constant mean, improving the normality of residuals with logarithmic transformation. AR(6), an autoregressive model, predicts current values using information up to six periods prior, confirmed its stationarity with the unit root test. The significant constant in ARIMA(0, 0, 0) suggests that a constant mean adequately models the series. In AR(6), the importance of the first lag emphasizes the impact of the most recent value. Finally, both ARIMA models indicate a good fit by not presenting significant residual autocorrelations, while AR(6) might better capture temporal dynamics by focusing on autoregression (**Figure 7**).

The selection between ARIMA(0, 0, 0) with logarithmic transformation and AR(6) is dictated by the complexity of the series and the purpose of the analysis. ARIMA(0, 0, 0) simplifies modeling to a constant mean, while AR(6) leverages recent temporal dependencies. The ARIMA(1, 0, 1) is found inadequate due to the insignificance of its coefficients. AR(6) is preferable for recognizing short-term autoregressive patterns, though the simplicity of ARIMA(0, 0, 0) may be beneficial where ease of interpretation is a priority. The decision is based on the balance between simplicity and accuracy, adjusting to the specificity of the time series.

3.2.1 Evaluating forecast results between the ARIMA(0, 0, 0) model with logarithmic transformation and the AR(6) model

The comparison between the ARIMA(0, 0, 0) model with logarithmic transformation and AR(6) reveals that the former, due to its simplicity and assumption of a constant mean, is preferable for stable series, although its utility is limited by uncertainty

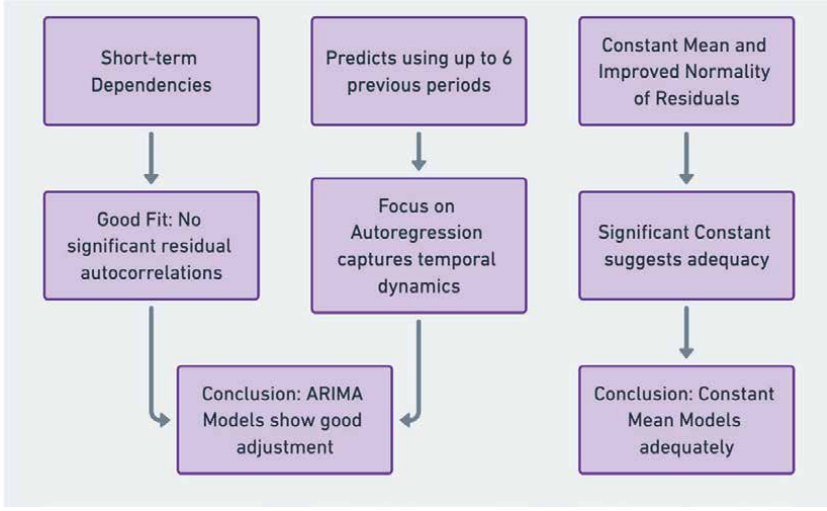

Figure 7.
Comparison of ARIMA and AR(6) Models.

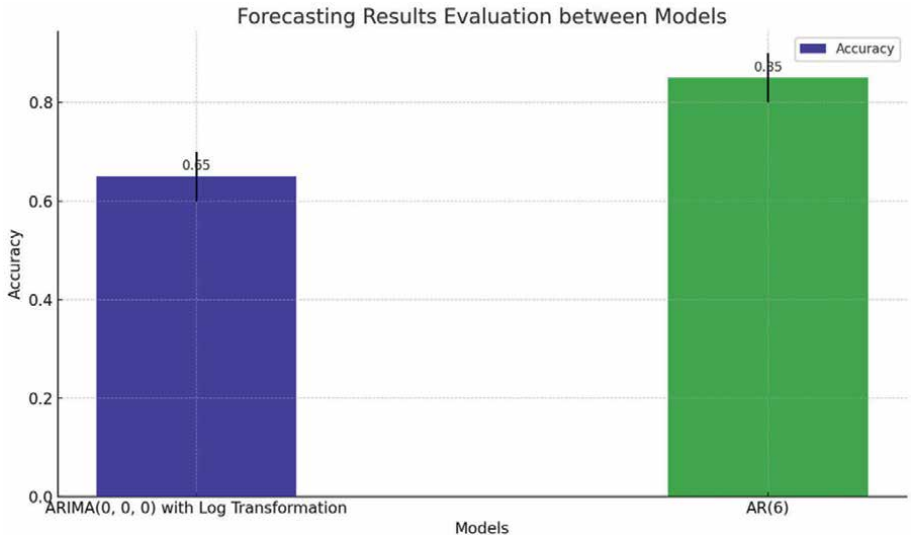

Figure 8.
Chart evaluating and comparing, through a simulation, the forecast results between the ARIMA(0, 0, 0) model with logarithmic transformation and the AR(6) model.

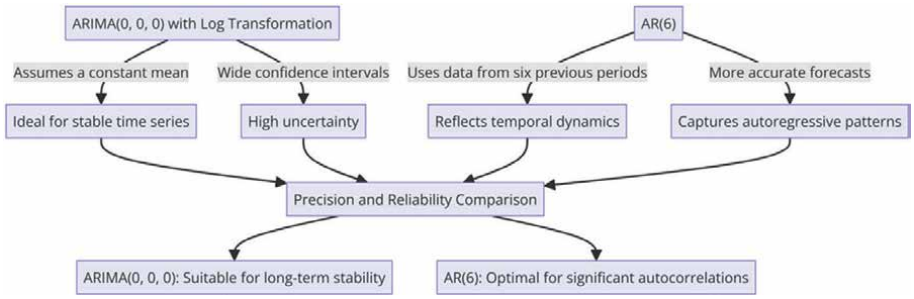

Figure 9.
Diagram offering a comparative view of the ARIMA(0, 0, 0) model with logarithmic transformation and AR(6) in terms of forecast accuracy and reliability.

reflected in wide confidence intervals. On the other hand, AR(6), leveraging data from six previous periods, is superior in capturing dynamics and temporal trends, ideal for series with significant recent autocorrelations and variations. The choice between the two depends on the nature of the time series and the balance between simplicity and predictive accuracy (**Figures 8** and **9**).

The selection of forecasting models, AR(6) or ARIMA(0, 0, 0) with logarithmic transformation, depends on the dynamics of the time series and the analytical purpose. AR(6) is optimal for short-term dependencies, while ARIMA(0, 0, 0) is better for stable series. Predictive accuracy and uncertainty should be evaluated through confidence intervals and analysis of historical variability (**Figure 10**).

4. Discussion

Significant analyses of time series autocorrelations and related topics have been conducted. There is a study on the disturbances of a time series and the removal of

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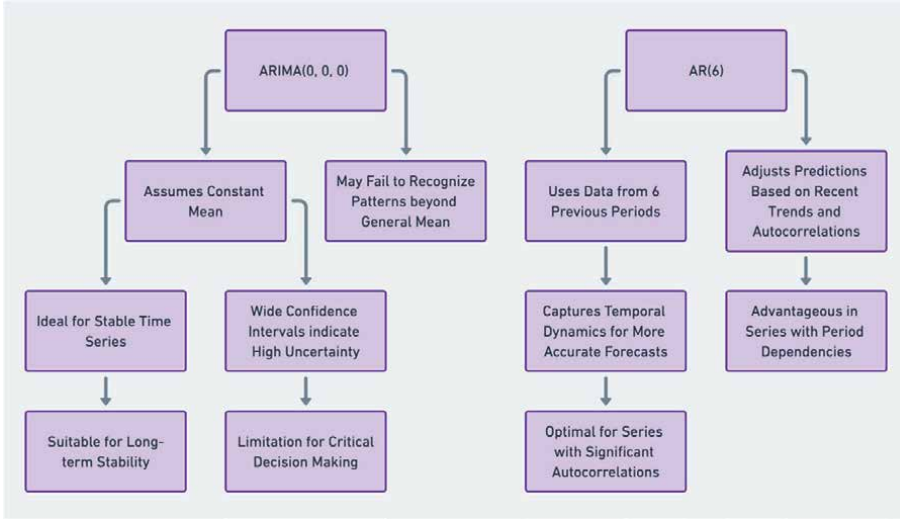

Figure 10.
Flowcharts illustrating the evaluation of forecast results between the ARIMA(0, 0, 0) model with logarithmic transformation and the AR(6) model.

trends through regressions over time or as a function of time. Various simulation processes using the Monte Carlo procedure have been carried out to study the presence of autocorrelations in the analysis of residuals and the most important statistics [7]. It is also used in medicine, for example, for causes of poor metabolism [8, 9].

The analysis of time series autocorrelations has also been used in the context of tourism. Thus, cultural tourism as an emerging product is addressed, analyzing changes in Western society and its impact on heritage and culture. Reflections on new concepts of heritage are offered, and changes in the definition of cultural tourism, as well as strategies for transforming heritage resources into tourist products, are analyzed [10]. Another study provides an overview of the main characteristics of people engaging in rural tourism in Spain, based on the results of a study conducted throughout the year 1994 [11]. This work discusses the need for reliable and coherent statistics on tourism and its interdependence with other economic and social sectors, highlighting the importance of designing a statistical system that represents the reality of tourism [12].

The ARIMA (AutoRegressive Integrated Moving Average) model is a statistical model used to analyze and predict time series. It has been used, for example, to predict the flow of the Amprong River, emphasizing the importance of accurate prediction for water management in agriculture [13]. Additionally, it has been used to predict the prices of rice grain, demonstrating its utility in the agricultural sector [14], and for forecasting time series [5]. The ARIMA model has also been used to project the yield of Chinese potatoes, showing its applicability in the prediction of agricultural yields [15]. It was used to predict the trajectory of the COVID-19 pandemic in the 15 most affected countries [16].

Regarding the use of the ARIMA model in the tourism sector, one study selected five different data sets on airlines, hotels, car rentals, and travel agencies in the U.S. tourism industry and used ETS and ARIMA models to predict data from 2000 to 2020 [6]. Another one focuses on the demand for whale watching tourism in Ulsan, using the seasonal ARIMA model for forecasts [17]. A study applies the ARIMA model to predict the demand for health tourism in Turkey [18]. Another study investigates how

rural tourism can promote high-quality development in Guangshan County region, using the ARIMA model [19]. Based on time series data of the number of domestic tourists in Hunan Province from 2000 to 2019, this study constructs an ARIMA model to predict the number of tourists in the next four years [20]. The ARIMA model has also been used in the context of tourism in Spain. Thus, one study improves the forecasting of tourist flows to Spain using Google search indexes related to travel to Spain. Two models are compared for Germany, the United Kingdom, and France: a conventional ARIMA model and a model augmented with the Google index [21]. Furthermore, the possibility of improving the predictive capacity of a tourism demand model with meteorological variables has been investigated, using as a case study the monthly British tourist demand toward the Balearic Islands (Spain). The results are compared to those obtained by non-causal methods such as an ARIMA model [22, 23].

5. Conclusion

The research on predicting visitor influx to the memorial cultural heritage of Alicante using ARIMA and Autoregressive models has revealed how fluctuations in the number of visitors can affect the management and conservation of Civil War shelters, identifying seasonal patterns and preferences among different types of visitors. This analysis has underscored the importance of resource planning tailored to temporal variations and the need to customize communication and education strategies for different visitor groups. Additionally, the geographically diverse interest in the shelters suggests potentials for promotion and collaboration at various levels. Among the statistical models evaluated, the ARIMA(0, 0, 0) with logarithmic transformation was identified as the most effective for modeling the time series of visits, though the AR(6) proved to be crucial for capturing short-term dynamics, highlighting the complexity of the time series. Despite the utility of the forecasts generated for future planning, the presence of uncertainty in predictions underscores the need for flexible management approaches. Therefore, the inclusion of more variables and the exploration of new models to refine the understanding and accuracy of predictions are recommended. The findings reinforce the relevance of adopting data-based strategies in cultural heritage management, pointing toward adaptability and anticipation as keys to its effective preservation. Thus, this study contributes to the field of cultural heritage management, offering a replicable methodological approach and highlighting the critical importance of academic research in the promotion and conservation of cultural heritage.

Conflict of interest

The authors declare no conflict of interest.

Declaration of generative AI and AI-assisted technologies in the writing process

During the preparation of this work, the authors used ChatGPT in order to enhance the text's writing quality and the creation of some graphics. After using this tool/service, the authors reviewed and edited the content as needed and take full responsibility for the content of the publication. The authors of the manuscript are Pablo Rosser and Seila Soler.

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Chapter 9

Integrating Agent-Based Simulations with Archeological Fieldwork through Log-Data Analysis

Fumihiro Sakahira, Yuji Yamaguchi, Takao Terano and Hiroomi Tsumura

Abstract

This chapter proposes a new framework that analyzes the log data from computational simulations to integrate agent-based simulation (ABS) with conventional fieldwork-based research in archeology. Specifically, machine learning methods are employed to extract the key branch points of each result from a large and diverse set of simulation results and the log data representing the process leading to them. In this framework, the ABS results are used to develop working hypotheses for facilitating fieldwork-based research, whereas those of fieldwork are used as inputs for the simulations, thereby resulting in bidirectional links rather than unidirectional ones. In a pilot application of this framework, the log data from a simulation of the cultural transformation from the Jomon period to the Yayoi period (16,000 to 2350 cal BP) in Western Japan are analyzed.

Keywords: agent-based simulation, cultural transformation, fieldwork, machine learning, log-data analysis, working hypothesis

1. Introduction

Archeology is critical for reconstructing the human past, obtaining essential data for understanding societal development, cultural exchange, and environmental adaptation. By studying historic artifacts and remains, archeology helps us uncover the stories of our ancestors, revealing how they lived, worked, and shaped the world we inherit. Recently, agent-based simulation (ABS) has been increasingly employed for archeological research [1, 2]. ABS involves modeling an agent, which is an autonomous decision-making entity, as a fundamental component of a system. It links the overall system behavior with the bottom-up behavior of the agent and can effectively reproduce the non-linear phenomena found in the real world.

The most popular ABS-based archeological studies are those that examined the demographic dynamics of the Ancestral Puebloans who lived in Long House Valley, Arizona, USA, from 800 to 1350 AD [3, 4]. These studies examined the factors influencing population dynamics in the region using several parameters including

paleoenvironmental variables and empirical data from social units. Specifically, these studies employed historical facts as constraints; the simulation results, which were consistent with historical facts, elucidated the effective model parameters for ABS-based archeological research. As such studies account for approximately 30% of all ABS-based archeology studies [5], they can be considered mainstream in the present day.

However, the rapid increase in ABS-based archeological research has led to concerns regarding the lack of engagement and feedback between simulation modelers and archeologists, primarily owing to the lack of comprehensive textbooks and handbooks on simulation techniques for archeologists. To address this issue, Romanowska [6] created a guide to facilitate simulation modeling for archeologists. Additionally, they have identified software complexity as an obstacle to adopting ABS. Therefore, archeology modeling software that does not require advanced programming knowledge is required [5].

However, we do not believe that archeologists can combine simulations and field-based research by learning to build models and create software, because the acquisition of simulation skills may not necessarily link these research disciplines. Therefore, methods that can link research results across various disciplines, rather than the skills and competencies of individual researchers, are required [7].

The mainstream approach described above features unidirectional linkages, wherein the results of conventional field-based research are taken as inputs and those of simulations are used as outputs [7]. Thus, it provides negligible feedback for conventional archeological research and does not sufficiently facilitate the research of archeologists primarily engaged in fieldwork.

Recently, a method that allows extracting the factors contributing to the decision-making from ABS results has been recently developed. It involves not only the macro-level analysis of simulation results [8, 9] but also the micro-level analysis of each agent [10]. Additionally, meso-level analysis methods that primarily use machine learning to classify considerable amounts of simulation log data into clusters and extract the differences between the clusters as micro-level behavior have also been proposed [11–13].

Based on these studies on log-data analysis of simulations and to address the issue of mainstream archeological ABS offering negligible feedback for fieldwork-based research, this chapter proposes a new framework that analyzes the log data of computational simulations to provide feedback on their results to facilitate conventional field-based research. Thus, it strengthens the bidirectional relationship between field-based archeological research and ABS by integrating the two. Specifically, machine learning methods are used to extract the branch points, i.e., the "if" scenarios, from a large set of diverse results obtained from the simulation and the log data, as illustrated in **Figure 1**. By using the simulation results that are consistent with real historical events and those that deviate from them as objective variables, and the log data of changes in the attribute variables of the agents (often sites or groups of people) and their behaviors as explanatory variables, we can determine the key archeological sites or groups that influenced the highly probable results consistent with real historical events. Subsequently, feedback on this field-based research helps generate working hypotheses, which can facilitate rediscovery and reinterpretation.

As a pilot application of this framework, this study conducted log-data analysis to simulate the cultural transformation in Western Japan from the Jomon to Yayoi period (16,000 to 2350 cal BP).

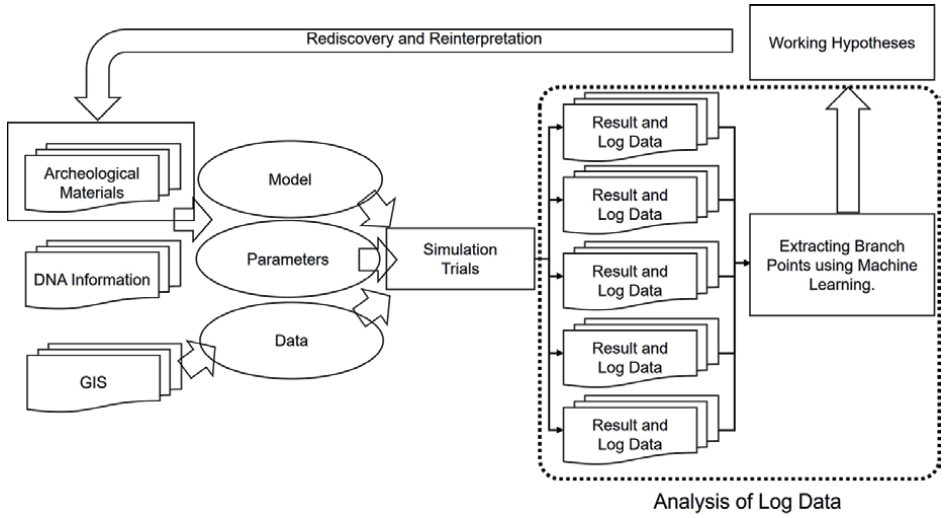

Figure 1.
Flowchart of the proposed framework.

2. Background

This section describes the prerequisites for understanding the proposed pilot application. The transformation of the Jomon culture, which was based on hunting and gathering, to the Yayoi culture, which was based on rice farming, represents the most significant cultural transformation in prehistoric Japan. The Yayoi culture was established by combining the Jomon culture in the ancient Japanese archipelago with the rice-farming culture introduced by immigrants from the Chinese continent and Korean Peninsula [14–16]. Rice farming was first introduced to Kyushu, the westernmost part of the main Japanese island, which is closest to mainland China and the Korean Peninsula. Subsequently, it spread to Eastern Japan over several hundred years during the Yayoi period.

Yamaguchi [17] offered a broader perspective on the cultural transformation from Jomon to Yayoi through a principal component analysis (PCA) of the composition changes in the structural remains of Jomon and Yayoi sites in Western Japan and quantitatively assessed the broad developments in the archeological sites between these periods. Their results indicated that major changes occurred in the Middle to Late Jomon and Final Jomon to Early Yayoi periods. Based on the eigenvectors, the former was interpreted as a change to a "genus-community orientation," represented by clay pits and ditch-like remains, whereas the latter was interpreted as a change to a "settlement orientation," represented by moat rings and storage pits.

The cultural transformation simulation described in this chapter is based on Yamaguchi's PCA of extracted patterns and modeled according to these change processes [18]. However, this chapter updates these results by adding data to the studies by Yamaguchi [17] and Sakahira et al. [18]. Furthermore, in the present study, regression tree analysis of the simulation log data was conducted to determine the key archeological sites responsible for the differences between the simulation results that were consistent with real historical events and those that deviated from them.

The remainder of this chapter is organized as follows. Section 3 describes the PCA employed for extracting cultural transformation patterns, and Section 4 presents the ABS of the cultural transformation process. Section 5 elucidates the regression tree

analysis of simulation log data to develop working hypotheses, and Section 6 presents the concluding remarks.

3. PCA for extracting cultural transformation patterns

3.1 Data and methods

To extract the patterns of transformation from the Jomon to the Yayoi period, the two periods were divided into detailed phases, as presented in **Table 1**. The traces of the settlements from these periods included various structural remains, which were tabulated according to each phase and used as variables. This is because it is difficult to quantitatively evaluate cultural transformation based on the number of structural remains at individual sites owing to the differences in the conditions, excavation scale, and information loss.

By conducting a PCA using these variables, we can create a composite variable that accurately represents the characteristics of an archeological site and visualizes its component dynamics during each phase. Consequently, the cultural dynamics between phases can be understood as changes in each principal component, which can be interpreted from one phase to another.

In this study, we added the newly excavated site data from the Jomon and Yayoi sites to those used by Yamaguchi [17], resulting in a dataset of 1209 sites, whose locations are shown in **Figure 2**. The dataset included the latitudes and longitudes of

Phase	Period	Date
0th	Incipient Jomon	16,000 to 11,500 cal BP
1st	Initial Jomon	11,500 to 7000 cal BP
2nd		
3rd	Early Jomon	7000 to 5500 cal BP
4th		
5th		
6th	Middle Jomon	5500 to 4500 cal BP
7th		
8th		
9th	Late Jomon	4500 to 3200 cal BP
10th		
11th		
12th	Final Jomon	3200 to 2800 cal BP
13th		
14th		
15th	Final Jomon/Initial Yayoi	2800 to 2350 cal BP
16th	Early Yayoi	

Table 1.
Phases and periods employed in this study.

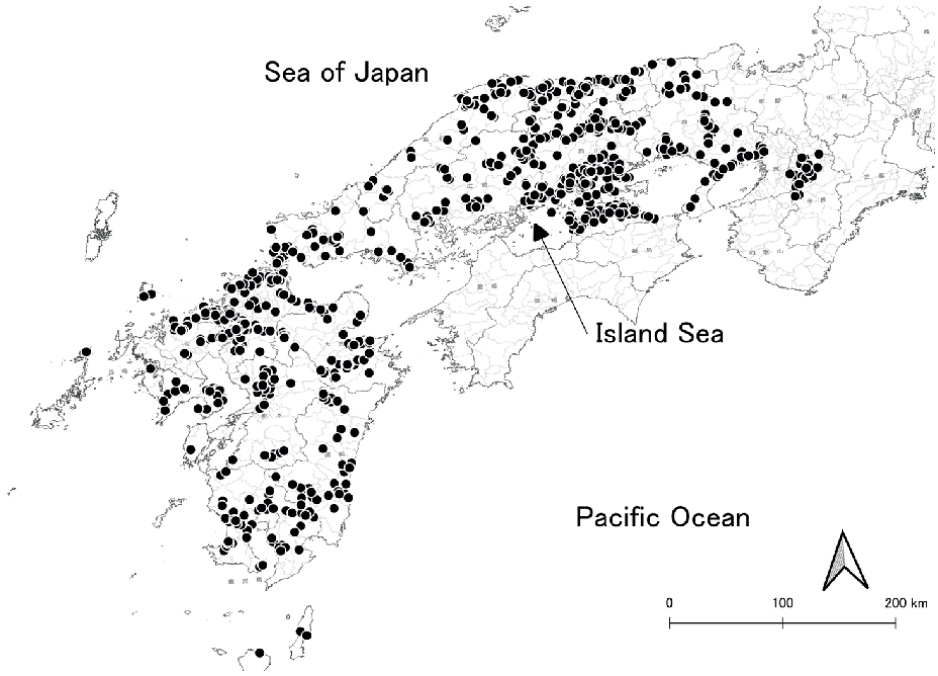

Figure 2.
Site locations. The black points indicate the archeological sites used in this study. This map is based on GSI Tiles provided by the Geospatial Information Authority of Japan.

the sites and indicated the presence or absence of various structural remains excavated during different phases. Additionally, the structural remains comprised moats, sinkholes, buildings, ditch-like remains, accumulation remains, dwellings, paddy field remains, pillar holes, storage holes, earthenware burials, earthenware pools, earth mines, tombs, and furnaces.

Accurate information regarding the phase to which artifacts and structural remains belong is crucial for analyzing time-series changes. Therefore, we analyzed only the remains whose time phases could be clearly identified based on the estimated dates of the pottery styles accompanying the structural remains. For each phase, we used the same categories as those used by Yamaguchi [17] (**Table 1**). The data presented in **Table 1** are based on those used by Fujio [19] and Kobayashi [20]. Similar to Yamaguchi [17], the structural-remain variables were assigned a value of 1 if they were found at the site and 0 otherwise. Thus, the variables reflected the presence or absence of archeological features at each site but not their quantities. Each site was categorized by phase, as shown in **Table 1**, and data from all sites comprising these structural remains in each phase were used for PCA.

3.2 Results and discussion

We conducted PCA based on the number of sites where the structural remains from each phase were detected, as reported by Yamaguchi [17]. The results are presented in **Table 2** and **Figure 3**. **Table 2** lists the eigenvectors for each principal component axis. As the cumulative contribution ratio of the first and second principal components is 0.803, they are used in the following discussion. Evidently, the first principal component

	First principal component	Second principal component
Moats	0.323	−0.020
Sinkholes	0.325	−0.106
Buildings	0.319	−0.172
Ditch-like remains	0.210	0.452
Accumulation remains	0.315	0.199
Dwellings	0.014	0.564
Paddy field remains	0.283	−0.098
Pillar holes	0.327	−0.114
Storage holes	0.245	0.360
Earthenware burial	−0.101	0.337
Earthenware pools	0.320	−0.164
Earth mines	−0.083	0.305
Tombs	0.280	−0.040
Furnaces	0.316	0.096
Eigenvalue	2.948	1.596
Contribution ratio	0.621	0.182
Cumulative contribution ratio	0.621	0.803

Table 2.
Eigenvectors and their contribution ratios.

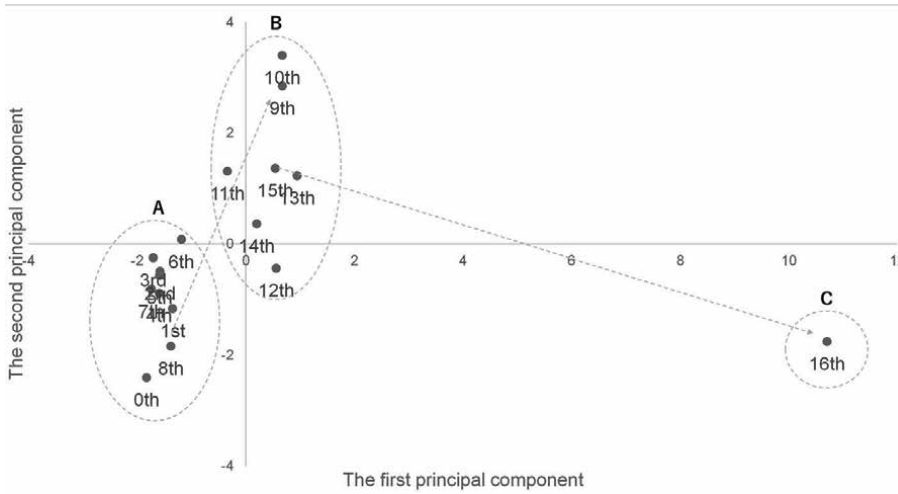

Figure 3.
PCA scores of the first and second principal components for each phase.

is positive for most variables (structural remains); however, considering the relatively large values for pillar holes, sinkholes, and moats, it can be interpreted as having a settlement orientation (+) ⇔ non-settlement orientation (−). This is because such remains are usually found in large settlements as sinkholes and moat rings were used to guard against

enemies. Additionally, the second principal component exhibits relatively large positive values for dwellings, ditch-like remains, and storage holes and negative values for buildings, earthenware pools, and pillar holes. Therefore, it can be interpreted as having a genus-community orientation (+) ⇔ non-genus-community orientation (−). The ditch-like remains, which are believed to be related to irrigation, appearing alongside storage pits are related to collective food production and preservation.

The PCA scores of the first and second principal components according to each phase are plotted in **Figure 3**. Based on their plot positions and timing continuities, the phases were categorized into three groups: (A) 0th–8th, (B) 9th–15th, and (C) 16th. The transformation from the 8th to 9th phase represents Groups A to B. It primarily represents a forward movement on the second principal component axis, i.e., a transformation toward a genus-community orientation. The transformation from the 15th to the 16th phase (Group B to C) is primarily a positive migration on the first principal component axis, i.e., transformation to a settlement orientation.

The PCA results suggest that the transformation from the Jomon to Yayoi culture was not a unidirectional one but encompassed two major transformation patterns with different directions. Our interpretation of the principal components of the eigenvectors differs slightly from that of Yamaguchi [17] probably because we added new data and revised the categories of the time phases. However, as shown in **Figure 3**, the consecutive phases with large differences between the first and second principal components, i.e., from the 8th to 9th and 15th to 16th phases, are similar to those reported by Yamaguchi [17]. Although the interpretation of the principal component axis is open to dispute, the two major changes exhibit patterns of shifts in different directions for the second principal component.

As the transformation patterns in the different directions suggest that their processes differed, there may exist two transformation directions. In the subsequent sections, ABS is used to analyze the differences in the cultural transformation processes by considering the parameters that can easily reproduce these two major transformation directions.

4. ABS of cultural transformation

4.1 Simulation model

We constructed an ABS model analogous to a generic genetic algorithm (GA) by replacing its parameters, i.e., the crossover and mutation rates, with those related to diffusion from outside the community and those related to non-diffusion, such as technological innovations, within the community, respectively. However, we used imitation (rate) rather than crossover (rate) because we assumed propagation from outside the village for a single genetic unit. Furthermore, we did not search for a solution to this GA. Rather, we examined the cultural transformation process based on whether the parameter that reproduced the solution more easily was the imitation rate related to external diffusion or the mutation rate related to non-diffusion within the village. Thus, the cultural transformation process was investigated to determine whether the solution was reached more quickly when the influence of either the imitation or mutation rate was stronger in the transformation from the 8th to 9th and 15th to 16th phases.

The description of the simulation model in the following subsection is based on the overview, design concepts, and detail (ODD) protocol [21, 22], which was employed to standardize and enhance the description owing to the criticism that agent-based models are not reproducible [21].

4.1.1 Agents and attribute variables

In the simulation model, the agent was an archeological site with the following attribute variables:

ID and spatial position: The agent contains the positional coordinates (X and Y) corresponding to the latitude and longitude of the actual site. For simplicity, we assumed that the descendants of site agents originating during the evolutionary simulation have the same positional coordinates as their parents. To imitate the gene for structural remains, the distance between each archeological site was considered to influence the target-site selection. Additionally, all sites from the same period were grouped and used as evaluation units for conducting simulations analogous to the GA described in the following subsection.

Gene: The remaining structural genes included moats, sinkholes, buildings, ditch-like remains, accumulation remains, dwellings, paddy field remains, pillar holes, storage holes, earthenware burials, earthenware pools, earth mines, tombs, and furnaces. Their value was set to 1 if they were present and 0 otherwise.

4.1.2 Process overview and scheduling

Similar to a generic GA, a single generation was considered one step and the submodels were sequentially executed within this step. However, the execution order of the agents was random. The following rules were employed:

Offspring generation: Fifty copies of descendant groups were generated from each parent group.

Imitation and mutation: Each offspring intragroup is subjected to imitation and mutation operations.

Evaluation and selection: The offspring group with the highest value was retained as the parent group for the next generation and the remaining were deleted.

4.1.3 Design concept

From the 11 concepts of the ODD protocol, we used 7 for our model, as listed in **Table 3**. Because the model was simple, these seven concepts were sufficient to ensure its reproducibility.

4.1.4 Submodels

The simulation model comprised three rules that were executed in the same order as that in the GA: offspring generation, imitation and mutation, and evaluation and selection (**Figure 4**).

Offspring generation rule: Fifty copies of the offspring group are generated. They inherit the positional coordinates and genes of each agent in the parent group. The gene composition of each agent in the parent group is the same as that of the structural remains of the real site at the beginning of the simulation. Subsequently, the gene compositions of the offspring groups change through imitation or mutation.

Imitation and mutation rule: The agents within each offspring group are subjected to imitation or mutation. Unlike the crossover operation of a generic GA, the other agents are imitated with a single genetic basis. Additionally, the locus sequence has a considerable effect. However, providing the locus sequence and corresponding relationships to each relic is challenging. Each locus represents a type of structural

No.	Design concepts	Elements
1	Basic principles	Similar to a GA, a set of offspring agents is created based on the set that becomes parents. Each agent group is subjected to imitation and mutation of the structural remains genes. The group of agents with the most similar structural remains genes composition to the actual composition of the group in the next phase is retained as the parent relic agent group and the others are deleted.
2	Emergence	Imitation and mutation operations within each agent group change the structural remains genes of each agent.
3	Adaption	The goal is to approach the actual structural remains genes composition of the group in the next phase.
4	Objective	The difference in the first and second principal component scores of the structural remains composition of the agent group in the next phase is reduced.
5	Interaction	Based on the imitation rate, one site imitates a structural remains gene of the agents from another site in each agent group.
6	Stochasticity	Selecting an agent from another site to imitate its remains gene. Location of the structural remains gene to be imitated. Location of the structural remains gene to be mutated. Execution order of the site agent.
7	Observation	First and second principal component scores for each agent group. Number of steps required for the difference in the first and second principal component scores of the structural remains composition of the agent group in the next phase to be within 0.25.

Table 3.
Design concepts.

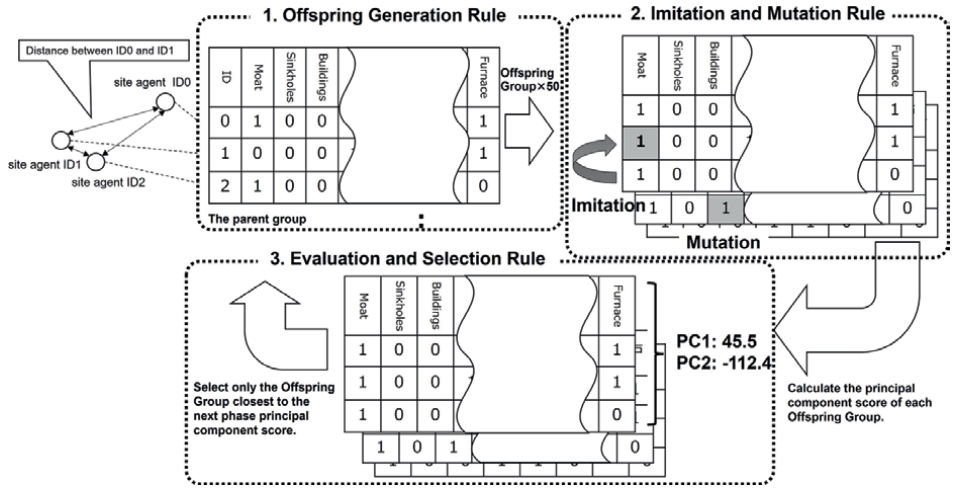

Figure 4.
Overview of the simulation model.

remains with a binary value (0 or 1). The genes of the other agents are imitated based on a parameter representing the imitation probability (imitation rate), as described below. Although the loci to be imitated were selected randomly, the sites to be

imitated were selected based on the distance between the coordinates of the two sites. The selection probability (P) is expressed as follows:

$$P_{i,j} = \frac{\exp^{\left(Dmax - D_{i,j}\right)}}{\sum_{k,m=1}^{n} \exp^{\left(Dmax - D_{k,m}\right)}} \quad (1)$$

where P_{ij} denotes the probability that agent i selects agent j from the same descendant group, D_{max} is the maximum coordinate distance between all agents, and D_{ij} is the coordinate distance between agents i and j. Notably, the coordinate distance is the Euclidean distance. As the type of network constructed between sites is unknown, assuming a specific network model may be problematic [23]. Therefore, rather than assuming a specific network model, the agent selects one agent from a descendant group as the imitation partner. However, because this selection employs a logit model, the selection probability decreases as the distance between the agents increases. The locus is randomly selected based on the mutation probability (mutation rate) parameter described in the next subsection and its value is changed to 1 if it is 0 and vice versa.

Evaluation and selection rule: The first and second principal component scores of each offspring group are calculated. Subsequently, the offspring group closest to the principal component score of the next target phase (e.g., if the start phase is the 8th phase, the target phase is the 9th phase) is retained as the parent group for the next step and all other descendant groups are deleted. The proximity of the first and second principal component scores is defined as the proximity of their Euclidean distance on the maps to their principal component axes. Thus, the Euclidean distance proximity corresponds to the cultural proximity based on the structural remains composition.

4.1.5 Initialization and number of simulation cases

We employed the imitation and mutation rates as the simulation parameters. Similar to the parameter settings of the generic GA, the sum of the imitation and mutation rates should be <100% to ensure that some offsprings remain unchanged. Consequently, eight simulation cases that combined the imitation and mutation rates were created for two simulation scenarios: transformations from the 8th to 9th and 15th to 16th phases (**Table 4**); 1000 trials were conducted for each case.

4.1.6 Evaluation index

The number of steps to reach the terminal condition of the simulation was used as the evaluation index. The terminal condition was that the first and second principal component scores approximate the next phase on the two-dimensional map within a Euclidean distance of 0.25. Thus, if the start time was the 8th phase, the approximation was the 9th phase, and if the start time was the 15th phase, the approximation was the 16th phase. Notably, if the same parent group was used for 30 consecutive generations, it was assumed that the termination condition was not reached. Additionally, the probability of reaching the terminal condition in this case was negligible. Therefore, we investigated the parameter combinations that led to the termination condition in lower steps as those were more likely to reproduce the transformations.

Case No.	Transformation	Imitation rate (%)	Mutation rate (%)
Case 1	8th to 9th Phase	95.0	0.5
Case 2		80.0	1.0
Case 3		70.0	2.0
Case 4		60.0	4.0
Case 5	15th to 16th Phase	95.0	0.5
Case 6		80.0	1.0
Case 7		70.0	2.0
Case 8		60.0	4.0

Table 4.
Simulation cases.

4.2 Results and discussion

Figure 5 shows a box plot of the number of steps required to reach the termination condition for Cases 1–7. As the termination condition was not reached in many trials in Case 8, it is not included in the figure.

For the transformation from the 8th to 9th phase, the cases with low imitation and high mutation rates required lower steps to reach the termination condition than those with high imitation and low mutation rates (**Figure 5**). However, the transformation from the 15th to 16th phase showed the opposite trend. For example, Case 4 reached the termination condition in lower steps than Case 1 for the 8th to 9th phase transformation. However, for the transformation from the 15th to 16th phase, Case 5 required lower steps than Case 7 to reach the termination condition. Although this study did not employ a large number of simulation cases and detailed parameter studies are lacking, the aforementioned comparison exhibits sufficient trends for interpretation.

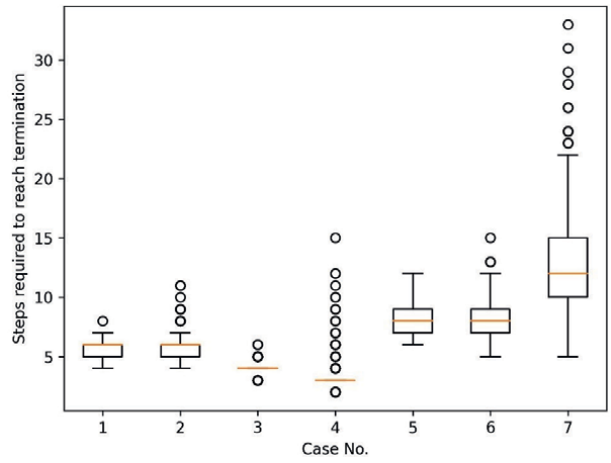

Figure 5.
Box plot of the number of steps required to reach the termination condition in each case. The orange horizontal lines indicate the median values, whereas the top and bottom lines of the boxes indicate the third and first quartiles, respectively. The short horizontal lines above and below the boxes indicate the maximum and minimum values, respectively, whereas the points above them indicate outliers. Case 8 was omitted because it did not reach the termination condition in many trials.

The simulation results suggest that the transformations from the 8th to 9th and 15th to 16th phases were caused by different processes. The transformation from the 15th to 16th phase is more convincing if we consider that the high rate of imitation is due to the frequent interactions between settlements. This transformation can be interpreted as a "continuous process" based on our finding that the state of the structural remains composition in the 15th phase approximates that in the 16th phase owing to intercommunity exchange. However, the results suggest that the transformation from the 8th to the 9th phase is due to factors other than frequent interactions between settlements. For example, technological innovations within a settlement are characterized by a high mutation rate. Therefore, this evolution can be interpreted as a "non-continuous process" that has not been influenced by the previous phase. Furthermore, because the positive direction of the first principal component changed considerably from the 15th to 16th phase (**Figure 3**), we can infer that the "settlement orientation" was advanced by a "continuous process." Moreover, the second principal component changed substantially in the positive direction from the 8th to 9th phase (**Figure 3**), which can be interpreted as the progress of the "genus-community orientation" via a "non-continuous process."

5. Regression tree analysis of simulation log data for deriving working hypotheses

5.1 Data and methods

This section discusses the derivation of the working hypotheses from the simulation results, which is the primary focus of this study, by analyzing the simulation log data through regression tree analysis.

We used the simulation results and log data from 4000 trials for Cases 1–4 and 3000 trials for Cases 5–7 to determine the agent that influenced the termination in lower steps, i.e., the agent that influenced the highly probable results consistent with real historical events. Specifically, for Cases 1–4, we examined which agent's mutation was key for reducing the steps required to reach the termination condition, whereas, for Cases 5–7, we investigated whose imitation was key for reducing the steps required to reach the termination condition. Therefore, the number of steps required to reach termination was used as the objective variable for all cases, whereas the numbers of mutations and imitations per agent were considered as the explanatory variables for Cases 1–4 and 5–7, respectively. Because the numbers of mutations and imitations were inevitably lower for cases that required lower steps to reach termination, the occurrence ratio, which is the number of mutations or imitations divided by the number of termination steps, was converted to a standardized value and used as an explanatory variable.

Subsequently, these variables were used to extract the explanatory variables for separating the numbers of objective variables through a regression tree analysis wherein the maximum tree depth was set to three.

5.2 Results

Figures 6 and 7 illustrate the regression tree and importance degrees, respectively, for Cases 1–4. From **Figure 7**, it is evident that the Kurotsuchi, Naganawate, and Takanohara are the key sites that distinguish the number of steps required to

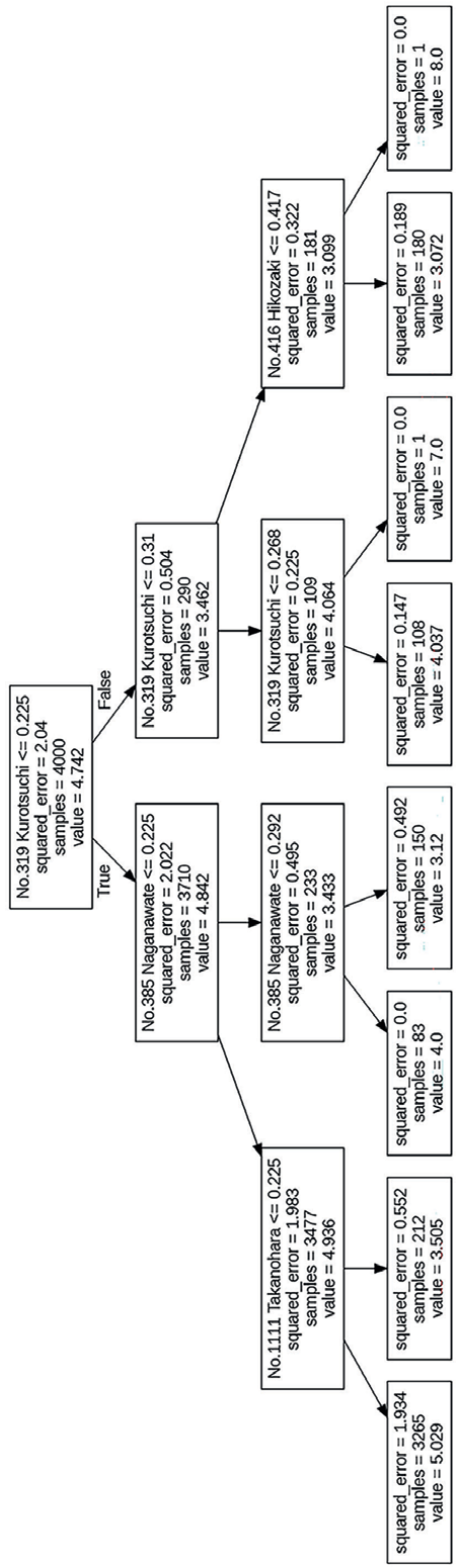

Figure 6.
Regression tree for cases 1–4.

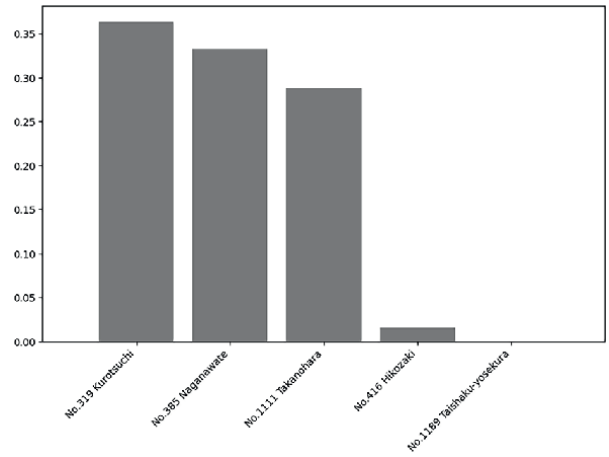

Figure 7.
Importance degrees for cases 1–4.

reach termination compared to the other sites. Additionally, **Figure 6** shows that, at the uppermost node, 4.842 steps were required on average to reach termination in simulation trials with a mutation ratio of ≤0.225 for the Kurotsuchi site, whereas 3.462 steps were required on average for simulation trials with a mutation ratio of >0.225. Thus, the number of steps required to reach termination was lower and the probability of being consistent with real historical events was higher in trials with more mutations for the Kurotsuchi site. Similarly, at the left node of the second level from the top of **Figure 6**, the number of steps required to reach termination was lower and the probability of being consistent with real historical events was higher in trials with more mutations for the Naganawate site. Furthermore, at the left node of the third level from the top, the number of steps required to reach termination was lower and the probability of being consistent with real historical events was higher in trials with more mutations for the Takanohara site. In summary, **Figure 6** shows that the Kurotsuchi, Naganawate, and Takanohara sites primarily affected the number of steps required to reach termination. Furthermore, when considered in conjunction with **Figure 7**, a higher number of mutations at the Kurotsuchi, Naganawate, and Takanohara sites led to the termination in lower steps, i.e., a higher probability of being consistent with real historical events.

Figures 8 and **9** show the regression tree and importance degrees, respectively, for Cases 5–7. From **Figure 9**, it is evident that the number of termination steps of Nagasuna 3,4 differs significantly from those of other sites. **Figure 8** shows that at the uppermost node, an average of 10.647 steps are required to reach termination in simulation trials with an imitation ratio of ≤0.121 for the Nagasuna 3,4 site, whereas an average of 8.243 steps are required for those with a mutation ratio of >0.121. Thus, the number of steps required to reach termination was lower and the probability of being consistent with real historical events was higher in trials with more imitations for the Nagasuna 3,4 site. In summary, **Figure 9** shows that the Nagasuna 3,4 site primarily affected the number of steps required to reach termination. Furthermore, when considered in conjunction with **Figure 8**, a higher number of mutations at the Nagasuna 3,4 site led to termination in lower steps required, i.e., a higher probability of being consistent with real historical events.

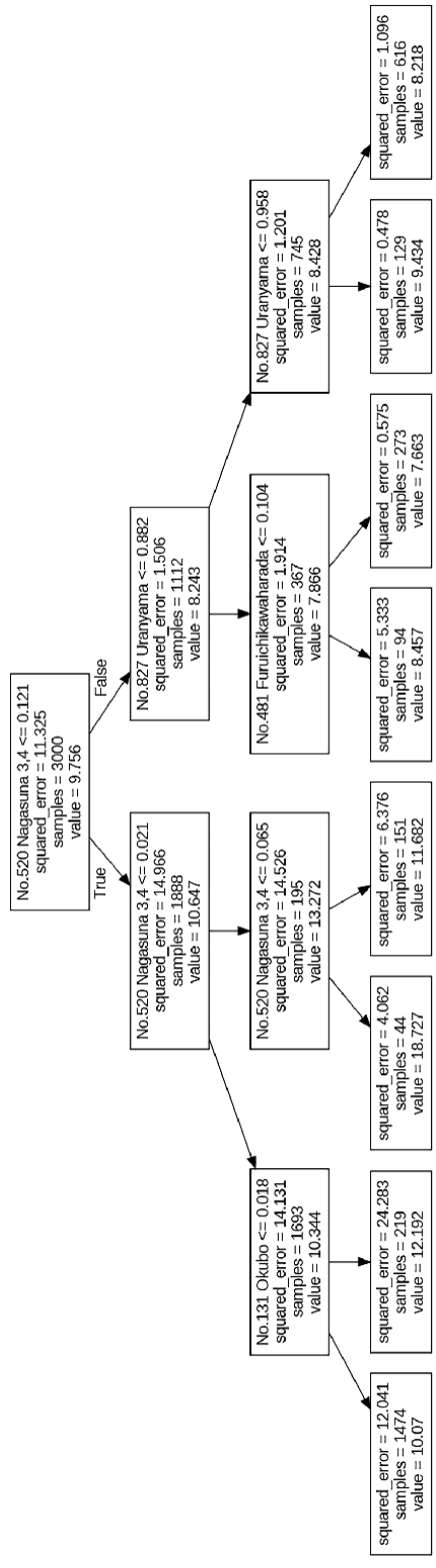

Figure 8.
Regression tree for cases 5–7.

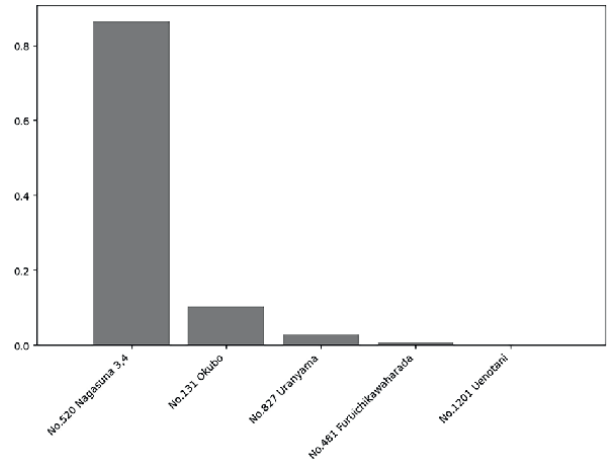

Figure 9.
Importance degrees for cases 5–7.

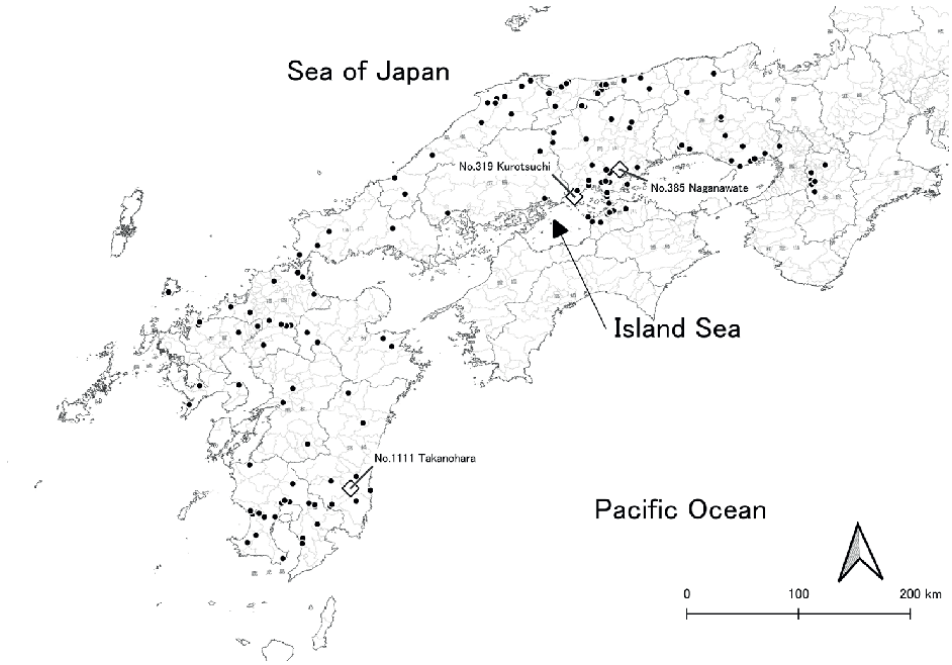

Figure 10.
Locations of the Kurotsuchi, Naganawate, and Takanohara sites, indicated by white diamonds. This map is based on GSI Tiles.

5.3 Discussion

In summary, the aforementioned results indicate that the higher the number of mutations at the Kurotsuchi, Naganawate, and Takanohara sites during the cultural transformation from the 8th to 9th phase, the lower the number of steps required to reach termination, i.e., the higher the probability of being consistent with real

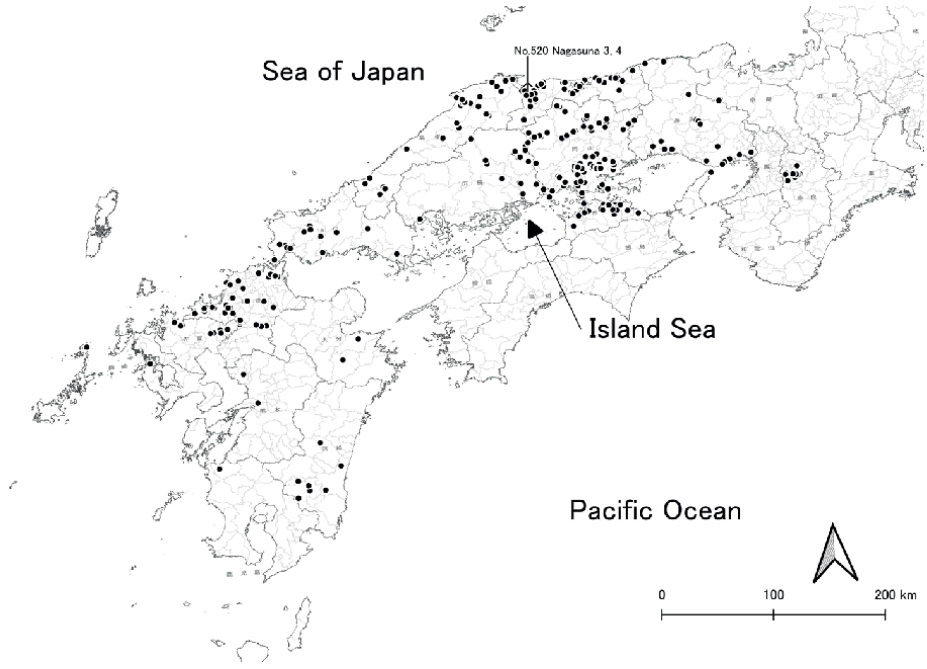

Figure 11.
Location of the Nagasuna site indicated by a white diamond. This map is based on GSI Tiles.

historical events. By contrast, the higher the number of imitations at the Nagasuna 3,4 site during the cultural transformation from the 15th to 16th phase, the lower the number of steps required to reach termination, i.e., the more probable the result. The locations of the sites are shown in **Figures 10** and **11**. **Figure 10** indicates that the three key sites for the cultural transformation from the 8th to 9th phase were located at both ends of the sites considered, whereas **Figure 11** shows that the key site for the cultural transformation from the 15th to 16th phase was near the Sea of Japan.

Based on these locations, the following working hypotheses were derived: the finding that the eastern sites (Kurotsuchi and Naganawate; **Figure 10**) were key for the cultural transformation from the 8th to 9th phase indicates an influx of population from Eastern to Western Japan. Additionally, previous archeological studies have assumed a population influx from Eastern to Western Japan based on an increase in the number of dwellings from the middle to late Jomon period, which corresponds to the 8th to 9th phase [24, 25]. However, this study did not include archeological data from Eastern Japan in the simulation. Therefore, it is highly likely that the population influx from Eastern Japan that was not included in the data appeared as a mutation, i.e., a "discontinuous process." This is also consistent with the aforementioned interpretation that a "genus-community orientation" developed owing to a "discontinuous process." In other words, the "community" of the "genus-community orientation" that appeared suddenly could represent a certain number of people from Eastern Japan. Similarly, it is possible that a population influx from the Nansei Islands caused the composition of the structural remains to change (in this case, a transformation to a "genus-community orientation") at the southern site (Takanohara; **Figure 10**) during the cultural transformation from the 8th to 9th phase. In the cultural transformation from the 15th to 16th phase, the Yayoi culture is considered to have progressively spread from the west to east; however, as the key site (Nagasuna 3, 4; **Figure 11**) is near the Sea of Japan, the

transformation to a "settlement orientation" that spread from the west may have not spread from Japan's Inland Sea side but from the Sea of Japan side.

In the future, based on the working hypothesis that the sites at both the East and West ends of Japan were key for the cultural transformation from the 8th to 9th phase whereas that located near the Sea of Japan side was key for the cultural transformation from the 15th to 16th phase, the simulation results can be validated by re-examining the mutational elements of "genus-community orientation" and the imitation elements of "settlement orientation" at these sites and those located close to them.

6. Concluding remarks

In summary, we applied machine learning to the agent-level log data of a cultural transformation simulation of prehistoric Western Japan to extract key archeological sites that influenced the highly probable results consistent with actual historical events. An agent-level log-data analysis of the simulation was used to develop working hypotheses that could serve as feedback for conventional archeological research. This framework does not involve a unidirectional linkage that has been primarily derived in other ABS-based studies by using the results of conventional archeological research, mainly fieldwork, as inputs; rather, it is a new framework that allows using ABS results as inputs for conventional archeological research. Thus, the proposed method strengthens the link between ABS and fieldwork by integrating them to promote archeological research.

As a precaution, it should be noted that these simulation results were generated only through computer simulations and should only be considered as working hypotheses that require testing. This is because archeological data that the proposed simulation uses as primary inputs are typically biased. Additionally, vigorous assumptions were made regarding the simulation model and evaluation indicators of the outputs. For example, archeological site data are biased because the archeological material that can be observed by researchers is only a part of what originally existed. Additionally, the presence or absence of remains is limited to the excavation areas. To minimize this bias, this study treated the archeological remains as a group using aggregate data from each period; however, the results may change with future large-scale discoveries. Moreover, this study assumed that parameter sets that require lower steps to reach the termination condition are more likely to reproduce past conditions than those that require more steps. Therefore, the results and their interpretations are only working hypotheses and do not directly reflect the actual conditions of these prehistoric times.

However, these precautions are not limited to this study but also apply to all ABS-based archeological research. Therefore, future studies must try to mitigate the falsifiability of simulation results to provide feedback for archeological research.

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Conflict of interest

The authors declare no conflict of interest.

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Chapter 10

Croatian Glagolitic Heritage: Elements and Contemporary Communication Practices

Marko Brkljačić and Tihana Babić

Abstract

Cultural heritage is the basis for sustainable development, key to biocultural diversity conservation, and an important factor to our long-term survival. Contemporary holistic approaches to heritage preservation emphasize the importance of the availability of cultural heritage and the active involvement and collaboration of relevant stakeholders. An important tool that enables this is communication. Glagolitic heritage is an important and representative part of Croatia's cultural identity. It is also a unique and diverse cultural phenomenon encompassing a broad specter of tangible and intangible elements, and a wide variety stakeholder. Based on a comprehensive review of previous research in the field of Croatian Glagolitic studies, the aim of this chapter was to identify the key elements and scope of Glagolitic heritage. Additionally, an overview of contemporary communication practices has been provided, encompassing diverse forms of heritage interpretation, promotional, and educational activities. This review has established the diversity of practices and identified a wide range of stakeholders engaged in the process of Glagolitic heritage communication. The chapter concludes with recommendations for the implementation of a Delphi study aimed at systematizing and identifying key factors for promoting networking, collaboration, and participation among stakeholders, ensuring the preservation and long-term sustainability of Glagolitic heritage through the development of innovative forms of communication.

Keywords: Croatian Glagolitic heritage, safeguarding, heritage management, multimodal communication, sustainability

1. Introduction

Cultural heritage is one of the most important resources that humanity as a whole, as well as individual nations and communities, possesses [1]. It represents the collective knowledge and experience accumulated throughout history, a multitude of ideas, values, historical narratives, identities (both individual and collective), systems, and skills [1, 2]. Heritage is the legacy of countless generations and communities that helped create, shape, preserve, and transmit it [2]. This knowledge and experience is

often connected to a specific territory, environment, and way of life [3]. It influences the way how the environment is perceived and how it is shaped, and represents a key factor for the sustainable management of natural resources [4]. Heritage is the basis of sustainable development, key to preserving biocultural diversity, and an important factor of our long-term survival [3, 5–8].

Recognizing the importance of preserving heritage as a common resource for future generations [9] and the potential challenges and adversities for its safeguarding commodification, uniformization, loss of diversity and value, and the inevitable and often unpredictable influence of safeguarding practices and imposed measures on heritage itself and the communities which help create and maintain it [3], heritage experts seek to devise innovative and sustainable forms of heritage management and communication [8, 10].

The growing awareness within the academic community, especially among heritage experts, that cultural heritage belongs to the public domain—to active citizens, local communities, and various civilian associations, and that the relevant stakeholders are numerous and diverse [10, 11], leads to a notion that the long-term preservation of heritage depends highly on public perception and that sustainable management heritage practices [10] are possible only through the cooperation of heritage experts, institutions, and local communities, and the participation of all relevant stakeholders in the process of safeguarding [12–15]. In this context, communication is understood as a tool which promotes stakeholder participation and cooperation [12], identification with heritage [10], and the raising of awareness of the significance and value of heritage [16].

Efficient heritage communication promotes stakeholder networking and participation in decision-making [9, 11]. It contributes to the empowerment of communities and strengthening of local capacities for the sustainable management of heritage resources [12, 17]. Effective communication holistically approaches the challenges of digital transformation of heritage, and the potential new technology has to offer for its communication, presentation, and preservation [18, 19]. It also contributes to the visibility and availability of heritage [20] and addresses the need to identify with cultural heritage as an important prerequisite for engaging stakeholders in the management process [10]. Thus, communication based on the principles of sustainable development and a holistic approach to heritage becomes a key factor for the engagement, education, and awareness raising of stakeholders about its value and significance [16], key to its long-term preservation [11, 21].

Glagolitic heritage is an important and representative part of Croatia's cultural identity. It is also a unique and diverse cultural phenomenon encompassing a broad specter of tangible and intangible elements—the Glagolitic script, but also language, text, literature, performative elements such as liturgy and Glagolitic chant, and a wide variety of cultural practices and skills required to perform them. In order to communicate the different dimensions and aspects of Croatian Glagolitic heritage to a wider audience, a broad range of strategies and modes of communication is required.

Based on a comprehensive review of previous research, the aim of this chapter is to identify and structure the main elements of Glagolitic heritage in relation to Croatian glagolitism (Cro. *glagoljaštvo*), a cultural and historic phenomenon characterized by the use of: (a) Glagolitic script, (b) Croatian Church Slavonic as a language of liturgy and literacy, and (c) adherence to the Roman Catholic church, its rules, ritual practices, and hierarchy [22], as well as to individual elements of Croatian Cyrillic and Latin literacy. Also, this chapter will provide an overview of contemporary communication practices focusing on the digitization, promotion, and revitalization

of Croatian Glagolitic heritage. Finally, a proposal will be made for future research aimed at identifying the key elements and forms of communication, which will enable the sustainable management of Croatian Glagolitic heritage, contributing to its long-term sustainability and preservation.

2. Toward a definition of Glagolitic heritage

2.1 The corpus of Glagolitic heritage: Written monuments

The earliest monuments of Glagolitic literacy in Croatia include epigraphic inscriptions dating from the eleventh and twelfth century, the Plomin inscription (eleventh c.), the bilingual Valun tablet (eleventh c.), Krk inscription (eleventh c.), Baška tablet (cca. 1100), Jurandvor fragment (eleventh–twelfth c.), Knin fragment (eleventh–twelfth c.), etc., as well as fragments and individual folios such as the Budapest fragments (eleventh–twelfth c.), Kiev folios (eleventh–twelfth c.), the Vienna folios (eleventh–twelfth c.), and the surviving folios of the so-called Codex Clozianus (eleventh c.) [23, 24].

The fourteenth and fifteenth centuries are considered by most experts as the golden age of Croatian glagolitism [22]. This period represents the peak of the economic and social power of the glagolites and production of handwritten manuscripts as well as the advent of print. Complete surviving handwritten manuscripts from this period include 31 handwritten breviaries, 16 Missals, 3 Psalters, and 3 Rituals, as well as countless fragments, individual folios, and partial manuscripts [23, 25]. Among the more noted ones are the Vatican Missal Illyrico 4 ($MVat_4$, beginning of fourteenth c.), Missal of Count Novak (MNov, 1368), Missal of Duke Hrvoje Vukčić Hrvatinić (MHrv, cca. 1404), Roč Missal (MRoč, cca. 1420), First Vrbnik Breviary ($BrVb_1$, thirteenth–fourteenth c.), Second Breviary of Novi (BrN_2, 1495.), Breviary of Vid from Omišalj (BrVo, 1396), Lobkovic's Psalter (PsLob, 1359), Fraščić's Psalter (PsFr, 1463), and the partially preserved Academia Ritual (RitAc, fifteenth c.) [23].

Besides codices intended for Occidental liturgy—Breviaries, Missals, Psalters, and Rituals written in the Croatian Church Slavonic language and Glagolitic script, the Glagolitic corpus consists of a rich and diverse literacy. This diversity is most evident in Croatian Miscellanies, with examples from the fourteenth century to the eighteenth century, which contain various genres of medieval literature from the lives of saints, apocryphal visions, legends, dialogs, exempla, miracles, juridical texts, and itineraries to the holy land, popular romances (Romance of Troy), and moral and didactic treatises, to medical recipes, amulets, and prayers. Croatian glagolites translated and compiled these texts from various sources written in Greek, Latin, Italian, and Czech [22, 26]. These translations were written in Croatian Church Slavonic, Croatian, or a mixture of Croatian Church Slavonic and Croatian language. Some of the most noted miscellanies are Borislavić Miscellany (CPar, 1375), Ivančić Miscellany (CIvan, fourteenth–fifteenth c.), Petris Miscellany (CPet, 1468) and Kolunić Miscellany (CKol, 1486), Klimantović Miscellany (CKlim, 1509), Žgombić's Miscellany (sixteenth c.), Gršković's Miscellany (sixteenth c.), and Grdović's Miscellany (sixteenth c.).

During the late Middle Ages, a growing need to codify oral law, legal practices, and traditions saw the codification of the earliest Croatian and also Slavic legal texts—the Vinodol Statute (thirteenth–fourteenth c.), Vrbnik Statute (1388), Istrian demarcation (fourteenth c.), and Kožljak demarcation (1395). A corpus of some eight hundred legal documents, dating from the eleventh to the end of the sixteenth century

and written in the vernacular Croatian language (predominantly of chakavian basis) and a cursive form of angular Glagolitic [27, 28], was collected and published in several editions of the notable "Acta Croatica" [29–31]. This rich corpus is a testimony of both the role of Glagolitic as a primary medium for writing Croatian and the use of Croatian language as an administrative language of law and legal practice throughout the Middle Ages, as well as a testimony to the rich and developed legal tradition of medieval Croatia.

Cursive Glagolitic and Croatian language were also used up to the nineteenth century in parish church registries in northern and central Dalmatia, resulting in numerous written monuments—from registries of birth, marriage, and death, to private documents, testimonies, and sales contracts, written by local parish priest or even literate laymen [32]. The use of Glagolitic on Krk island and Poljica municipality also saw the development of a proper notary [33].

An important part of the corpus of Glagolitic written heritage are epigraphic inscriptions. Some 517 inscriptions of Glagolitic, dating from the twelfth to eighteenth century, carved in stone (occasionally wood, clay, or metal) and graphite's scratched on the surface of walls and frescoes, have been cataloged by Branko Fučić and published in his monumental edition "Glagolitic inscriptions" [34]. Since the publishing of this edition in 1982, numerous previously uncatalogued inscriptions have been discovered, adding to this already rich corpus [35, 36].

Peak production of written manuscripts and the adoption of print cemented the interconnectedness of glagolites in the cultural and technological advancements of fifteenth-century Europe. In February 22, 1483, only 28 years after the first edition of Gutenberg's bible, Croatian glagolites finished printing a Glagolitic "Missal by the law of the Roman court." The first Croatian printed book is also the first European book printed on a script other than Latin, first book printed in the Slavic-speaking world, as well as the first to introduce the use of split letters, a typographic innovation used to create the staple Glagolitic ligatures consisting of combinations from two to up to five letters.

Five Glagolitic incunabulae (books printed before 1500) editions are known so far, with a suspected sixth (Matej Zadranin's "Traktat o ispovijedi") attested in sources, a copy of which is yet to be found [37]. Glagolitic printing presses existed in Senj (1494–1496, 1507–1508) with its seven published editions, Rijeka (1530–1531), with its six Glagolitic editions and possibly in Kosinj [38]. Venice, the capital of print, saw the publication of several Glagolitic editions, the Baromić Breviary (1493), Missal of Pavao Modrušanin, and the first Glagolitic primer from 1527 [38–40]. Also, Croatian glagolites often worked as apprentices for Venice's numerous printers, such as Blaž Baromić who before establishing the Glagolitic printing press in Senj, honed his craft in the workshop of Andrea Torresani. The protestant printing press in Urach near Tubingen, in the period from 1561 to 1564, published 13 books in Glagolitic (or "Croatian letters and language" as the Urach printers themselves called the script) and another 17 books in the Croatian language, and Cyrillic (8) and Latin script (6), altogether published in more than 30,000 copies [41].

The fear of the potential heretic content of Protestant Glagolitic editions printed in Tubingen which circulated among Croatian glagolities, especially in Krk and Istria region, and the growing counter reformation, saw the monopolization of Glagolitic print by the "Congregatio the Propaganda Fide" and its centralization in Rome. This period is also marked by the systematic rusinification of Croatian Church Slavonic language as well as some innovations in the orthography of Glagolitic script. This period in general is seen as having a negative influence for the use of Glagolitic and

Church Slavonic language in liturgy. The priesthood in Dalmatia and other parts of Croatia often resisted using the Propaganda fide editions, leading occasionally to the abandonment of Glagolitic rite and adoption of vernacular Croatian known as Šćavet.

This process continued until the nineteenth century, when Dragutin Antun Parčić revised the language of liturgical books, now termed "New Church Slavonic" language, and published his Glagolitic Rimьski Misalь slavênьskimь ezikomь presv. G. N. Urbana Papi VIII povelêniemь (Rome, Congr. de Propaganda Fide, 1893), the last liturgical book printed in Glagolitic script.

2.2 Heritage lost

While defining the corpus and extent of Glagolitic heritage we need to take into consideration the presumed, the unpreserved, destroyed, or lost part of this heritage. Especially considering the numerous confirmations and testimonies of its existence in the past, its occasional (and sometimes systematic) destruction, the expropriation of codices, and the systemic abandonment of the use of Church Slavonic language in liturgy, a trend which culminated with the Second Vatican Council, in favor of more contemporary practices, language and ritual. On the other hand, if we base our conclusions exclusively on the current state of affair and take into consideration only the preserved corpus of monuments, this "reliquiae reliquiarum," we will not be able to envision a complete image of glagolitism or draw plausible conclusions on its historical development and significance for Croatian culture and identity.

2.3 "Rasuta bašćina": Dispersed heritage

A large number of Glagolitic codices, folios, and fragments are located in libraries, museums, and private collections outside the territory of the Republic of Croatia. These monuments include individual Croatian Glagolitic handwritten or printed codices, but are sometimes comprised of entire collections of handwritten Croatian Glagolitic, such as the famous Berčić collection kept in the Russian National library in St. Petersburg [42]. Occasional news of auctioned Croatian Glagolitic codices or individual folios testify that a portion of this heritage is in the hands of private collectors (see for instance the folio of the fraternity of Saint Mary from Gorica on Krk island, 1425). It is not uncommon that these private collections are entrusted for safekeeping to state institutions such as national libraries and archives, but are mostly unavailable to the general public or unknown to the scientific community.

Croatian Glagolitic codices have in most parts shared the fate of the Croatian nation, mirroring the fate of the Croatian national corpus. Some of the most exquisite examples of medieval handwritten monuments are located abroad—either as a result of war and conflicts (Missal of Duke Hrvoje Vukčić Hrvatinić, MHrv, 1403–1404), theft and confiscation (e.g., the cursive Glagolitic description of the battle of Siget by Franje Črnko, sixteenth c.), systematic collecting of archival material by state institutions, such as those led by the Austrian imperial (national) library (Breviary of Vid of Omišalj, BrVo, 1396), or through the activities of traveling collectors and antiquaries (Missal of Prince Novak, MNov, 1368).

Due to the aforementioned reasons, heritage experts in Croatia often find themselves communicating and presenting heritage who's original is not present in material form. In contemporary museum exhibitions and communication practices, especially in institutions dedicated to the safeguarding of heritage through its education and communication such as eco-museums and heritage interpretation centers, the lack

of a "material original" ("authentic" artifact) does not present a significant obstacle in the communication of the significance and value of heritage [43], particularly considering the wide array of possibilities and solutions provided by the advancement in technology and digitization [44]. Still, in line of what was said, several facts point to the significance of cataloging Glagolitic heritage and the creation of registers as a prerequisite of every form of communication and presentation, and its legal protection and valorization as part of Croatian national heritage.

2.4 Geographical extent of glagolitism

It is difficult to determine the finite geographical limits to the spread of glagolitism in the past, especially due to the complex history and heritage of centuries of war which left severe and dramatic economic, cultural, social, and demographic effects. Also, the reconquista of the Croatian territory under Ottoman rule spearheaded by Venice and Austria in the seventeenth and eighteenth centuries, the imperial politics of Austria and later fascist Italy, and the influence of both the ecumenical actions of the Propaganda Fide and reformist tendencies within the Catholic church which often had little understanding and consideration for non-universal and autochthonous cultural and religious practices. In spite of these arguments, the new material fragments that continue to emerge in archaeological dig sites, such as the Glagolitic inscriptions from Konavle and Župa Dubrovačka, and the Glagolitic graffiti and inscriptions from Slavonia, testify that the influence of Glagolitic literacy and culture was more widespread than was previously considered, especially in the earlier periods of Glagolitic history [45, 46].

3. The Cyrillic and Latin dimension of glagolitism and Glagolitic heritage

Defining the position of Cyrillic and Latin dimension of glagolitism is important for understanding both glagolitism as a historic phenomenon and Glagolitic heritage as its contemporary reception.

On the territory of modern-day Croatia, since the Middle Ages to the early modern period, three scripts were in parallel use: the Glagolitic, Latin, and Cyrillic script, alongside three languages—Croatian, Croatian Church Slavonic, and Latin. This phenomenon was termed by researchers as the trilingual and triliterate culture of medieval Croatia [47–49]. Milan Mihaljević further added to the understanding of the phenomenon by terming the linguistic situation as a Latin-Slavic bilingualism with a Slavic triglossia [50]. These notions and concepts contributed greatly to the understanding and defining of the scope of both medieval Croatian culture, literacy, and Glagolitic heritage and proposed a new view on the Latin and Cyrillic dimension of Glagolitic heritage. They also opened new questions on the nature of the interconnectedness of the Latin and Croatian Cyrillic corpus with the Glagolitic, as well as the issue of deliminating (or not) these corpora.

3.1 The relationship between Glagolitic and Cyrillic literacy

The testimonies of Cyrillic literacy on the Croatian language include epistolary proze—letters of Croatian nobility and chancery, trans-border correspondence between Venetian and Ottoman government officials and military personnel [51–53], as well as some of the greatest monuments of Croatian law and literacy (Poljica

statute and documents written in *Poljičica*—a regional and unique form of Croatian Cyrillic script). Combining Glagolitic and Cyrillic letters is also present in older Glagolitic epigraphy [34, 54]. Some of the oldest inscriptions combine (purposefully or not) Glagolitic and (Croatian) Cyrillic letters—such as the Knin Fragment (eleventh–twelfth c.); Supetar fragment (twelfth c.); and Plastovo fragment (eleventh–twelfth c.) [55]. Individual Cyrillic letters were used as initials in some Croatian Glagolitic codices. The most illustrative examples of the symbiotic relationship between Glagolitic and Croatian Cyrillic, and of the inclusion of Croatian Cyrillic literacy in the corpus of Croatian Glagolitic heritage are the Glagolite priests of the Principality of Poljica (or as they were locally called Popi Arvati/Arvaćani—Croatian priests), as well as their offshots on Brač island (hermitages of Blaca, Dračeva luka founded by Poljica glagolites, also other older glagolite hermit communities which developed independent of the activities of Poljica glagolites) [56, 57]. It is a known and well attested fact that numerous Glagolitic clergymen and members of Croatian nobility during the middle and early modern period knew and actively used all three scripts, either out of practical necessity (official and private correspondence) or as an expression of attitude, identity, and education (Croatian Cyrillic rubrics in Croatian Glagolitic missals, autographing on all three scriptures, Croatian Glagolitic azbuka/alphabets in Cyrillic codices, and vice versa). All three scripts were used in the communication between church centers and diocesan priesthood of individual (arch)bishoprics (Zadar, Nin, Split, Šibenik). Also, Croatian Cyrillic is found in Glagolitic parish registers of the archidiocese of Zadar and diocese of Nin. The spread of Croatian Cyrillic to Northern Dalmatia, especially the Zadar archipelago, can be linked to the migration of Croatian Catholic population from southern Croatian regions and Bosnia, due to Ottoman incursions from the fifteenth century, as well as a reflection of the multiscriptural culture of Croatian glagolites [58].

This also raises the issue of how individual Cyrillic texts (Miroslav Evangelistary) and inscription (epitaphs on Bosnian—hum bilizi/stećak tombstones) are related to the corpus of Croatian Cyrillic heritage [54, 59, 60].

3.2 Relationship between Glagolitic and Latin literacy

A separate question is the relationship between the Glagolitic heritage and its Latin corpus—text written in the Latin script and the old Croatian language—especially *šćavet* (tal. *schiavetto*).

The term šćavet (*slavet*, *skjavet*) is primarily used for the lectionary [61], but is also used as a term for other liturgical (and paraliturgical) texts on the Croatian vernacular written in Latin script. It is characterized by a special orthography—the use of diphthongs for writing letters containing diacritics (č, ć, ž, š, đ), as well as a substitute letter for h–x. Whether there are other liturgical texts besides the lectionary—such as mass forms on the aforementioned old Croatian (vernacular) language, the author of these line is unsure! Šćavet significantly contributed to the formation of the liturgical horizon of the early modern period Croatia [62, 63] and also influenced the formation of a unique form of liturgical chant nowadays known as the glagolitic or folk liturgical chant [64]. It is important to understand that šćavet, and in line Glagolitic heritage, does not include all the written productions on the (old) Croatian language and Latin orthography. For example, the "Law and order of the nuns sisters Dominicans" and the "Šibenik prayer" are not included in the corpus of the Glagolitic heritage, even though they may have evolved under the influence of the literacy and production of the glagolites, and on the territory of the Adriatic communes where for

centuries the Glagolitic-Church Slavonic, Latin, and also Greek and Cyrillic literacy and liturgy coexisted well into the late Middle Ages [65].

Also, a series of questions is posed in the attempt to define the term *šćavet* in relationship to the diversity of phenomenon encompassed by this term throughout history. Can we include numerous handwritten choral books of Dalmatian-Croatian fraternities, which are written in Latin script and vernacular Croatian in the corpus of Glagolitic heritage [66]? Especially since both their text and melodies were influenced by the much older Glagolitic chant and Church Slavonic literary tradition and liturgy. Also does Šćavet encompass younger printed liturgical manuals—*Bogoslužbenike* and collections of popular church songs accompanied by musical notation and interpreted for choral singing? What is the relationship between šćavet and various traditions of folk liturgical chant on the vernacular Croatian language which developed either as part of liturgy on the Church Slavonic language or even as part of Latin liturgy, as is the case in southern Croatian regions (from the Split aquatorium, to Dubrovnik, Konavle, and Boka Kotorska). What is the relationship between Glagolitic heritage and the folk liturgical chant in Central Dalmatia—does it belong to the corpus of Glagolitic chant and hence Glagolitic heritage? Also, what is the relation between texts written in Glagolitic and the old Croatian language, such as the sequences in the "Paris Miscellany" (Code slave 11, 1380) [67–69], as well as other examples of poetry from Croatian Glagolitic literature, to the Latin šćavet. Does Glagolitic heritage (unlike the narrower term Croatian Glagolitic literacy—which includes only the written production on the Glagolitic script) also include the written production on Latin script (primarily šćavet) and Croatian Cyrillic on the vernacular Croatian language and Croatian—Church Slavonic amalgam?

3.3 Glagolitic heritage in relation to the term Cyrillo-Methodian heritage

The term Cyrillo-Methodian heritage primarily denotes two things—the development of the cult and worship of the Holy brothers Cyrillus and Methodius in Croatia (and in other Slavic countries, especially Czech, Slovakia, Bulgaria, and Macedonia) in the nineteenth and twentieth centuries in relation to the work of bishop J. J. Strossmayer and historian Franjo Rački and the struggle for the preservation, renewal/restitution, and spread of the use of Croatian Church Slavonic language in liturgy, all within a larger geopolitical framework of the Panslavic movement, Habsburg and Austro-Hungarian imperial politics, as well as the ambitions of the Kingdom of Yugoslavia [70–73].

The other meaning of this term refers to the entire legacy of the missionary work of Saint Cyrillus and Methodius and their pupils in Moravia and its latter dissemination to other Slavic-speaking countries and future development (see the work of S. Damjanović; E. Hercigonja; M. Žagar; M. A. Pantelić; and other authors). In this context, the term Cyrillo-Methodian heritage has been used, especially in twentieth-century scientific discourse to denote the entire legacy of the use of Church Slavonic language in liturgy (both eastern and western), the existence and use of both Glagolitic and Cyrillic, and the literacy, culture, and written monuments of both scripts [74].

3.4 Multimodality of Glagolitic heritage

Glagolitic heritage is a multimodal phenomenon. The Glagolitic script itself—the Glagolitic alphabet-*azbuka*, represents a complex communication system which

contains several semiotic layers. For instance, every sign in the Glagolitic alphabet is both a letter, word, and number as well as having the semantic level of meaning as a graphic symbol [75–79]. Numerous aspects of Glagolitic heritage include aspects of performativity—from liturgical drama (such as *Visitatio sepulchri* and passion plays), to Glagolitic liturgy and chant, as well as the numerous Croatian Glagolitic texts (apocrypha, legends, miracles, and Vitae of saints) that were often transmitted orally, from generation to generation within monastic and clerical communities through practice and performance [80–85]. In order to successfully communicate all the different dimensions and aspects of Glagolitic heritage to the widest possible audience and create new users/future stakeholders, it is necessary to rethink new forms and methods of its presentation [86].

4. Defining Glagolitic heritage

Glagolitic heritage is a term used in scientific and public discourse to denote the entire corpus of Croatian glagolitism (Cro. *glagoljaštvo*), a cultural and historic phenomenon characterized by the use of: (a) Glagolitic script, (b) Croatian Church Slavonic as a language of liturgy and literacy, and (c) adherence to the Roman Catholic church, its rules, ritual practices, and hierarchy [22, 87].

The term Glagolitic heritage encompasses a broad and diverse spectrum of cultural phenomenon linked primarily to the use of the Glagolitic script, but also to the literary production on Croatian Cyrillic and Latin script, and the Croatian vernacular, Church Slavonic language, or the amalgam of these two languages [23, 88, 89]. It includes both intangible elements such as liturgy on Croatian Church Slavonic, the Glagolitic chant [90], liturgical drama, literacy and literature, and tangible—monuments of Glagolitic literacy in the form of numerous handwritten and printed Glagolitic codices such as missals, breviaries, psalters and miscellanies, parish and monastic registries, inventories, notary protocols, medieval communal statutes, legal documents and charters, as well as hundreds of epigraphic inscriptions—Glagolitic texts inscribed in stone, wood, clay, and metal. Finally, it includes numerous fragments of Glagolitic texts and individual folios.

But while the term glagolitism (Cro. *glagoljaštvo*) refers explicitly to the past and its remains (either tangible or intangible), Glagolitic heritage can be understood as a form of collective memory [91], formed by processes of selection and interpretation through various practices, such as heritage communication, education, revitalization, as well as commodification and branding of cultural heritage [91, 92].

5. Contemporary practices

Contemporary practices concerning the communication, safeguarding, and revitalization of Glagolitic heritage involve a wide array of stakeholders and practices.

Individual aspects of Glagolitic heritage have been inscribed in the national Registry of cultural property of the Republic of Croatia: the Glagolitic chant in 2008 (reg. num. Z-3620), the art of reading, writing and printing Glagolitic in 2014 (reg. num. Z-6236), and the Kantanje/singing of the Virgin Mary's lament of Imotski and Vrgorac region (reg. num. Z-7335). Unfortunately, only a small number of individual monuments have been inscribed in the Registry.

The Glagolitic script is part of school curriculums and is being taught in elementary and high schools [91]. The topic is studied more in depth in extracurricular activities such as Glagolite School groups offered in some primary and high schools. This is primarily due to the effort an enthusiasm of numerous teachers and school librarians who recognized the value of Glagolitic and often expand the framework set by educational programs [92, 93].

Numerous activities and projects focus on raising heritage literacy and teaching Glagolitic script to youths outside formal education. Various forms of informal education are available and include periodic workshops, courses, and annual summer schools dedicated to learning the Glagolitic script. A number of civil associations is dedicated to the promotion, preservation, and revitalization of Croatian Glagolitic heritage. Among these a prominent role has the Friends of Glagolitic association in Zagreb. This association was founded in 1993, in the wake of the Croatian War of Independence, as a result of collaboration between experts, among which numerous academics and university faculty, and amateurs and enthusiasts focused on promoting Glagolitic heritage through public lectures, popular print editions, workshops, and other popular activities aimed at a wider, non-academic audience.

Numerous artists such as Frane Paro draw their inspiration from the Glagolitic script. Also, a number of local, community-based products, intended as souvenirs, are based on elements of Glagolitic heritage. Numerous community-based activities focus on youth education and the promotion of Glagolitic heritage, such as the "Sabor glagoljaša slovo Rogovsko" manifestation, annually held in Saint Filip and Jakov [92].

A number of videogames has been designed to promote the learning of Glagolitic script in innovative and creative ways [94]. The project GlagoMatika, a program and math contest designed for youths and based on the numeric version of Glagolitic letters, organizes regional and even international competitions connecting the STEM field with cultural (Glagolitic) heritage. IT experts, many of them members of faculty, collaborators, or ex-students of Faculty of Electrical Engineering and Computing (FER) or the Department of Information and Communication Sciences, designed a number of Glagolitic alphabet fonts, available online, in open source free to download, as well as at least two programs that enable direct transcription from Latin script to the Glagolitic alphabet [78]. Glagolitic script also has its own Unicode block (range from U + 2C00 to U + 2C5F) [95]. The Innsbruck University Transkribus platform has models specially trained for the transliteration of medieval printed and handwritten Glagolitic codices.

Besides Zagreb there are several important centers for contemporary research and innovative communication of Glagolitic heritage in Croatia, notably Zadar, Krk island and Istria, Rijeka, Split, and more recently Osijek and Poljica.

GlagoLab center for the research of glagolitism is part of Zadar University [96]. Its foundation is the culmination of years of work on the field of research and promotion of the rich Glagolitic heritage of Zadar archdiocese and a successful project titled: "Digitization, bibliographic description and research of texts written in Glagolitic, Croatian Cyrillic and Latin scripts until the end of nineteenth century in Zadar and Šibenik area" [97]. This project was achieved through cooperation with the Graz based Vestigia manuscript research center, which offered technical support, education, and scanning equipment [97]. The GlagoLab center also employs creative and innovative technologies and methods in the research and communication of Glagolitic heritage, such as the use of crowdsourcing as a method for the transliteration of digitized manuscript by using the Transkribus tool and a set of clear instruction intended for nonacademic users [98]. Extremely important work is done with the education

of new generations of young experts whose masters or PhD thesis, done within the framework of the center's activities, are focused on the creation of digital exhibitions, cultural routes, digital archives, etc. Zadar also has an active Association of Zadar glagolites, which organizes numerous activities. Also, the Zadar archbishopric issues reprints and transliterations of Glagolitic manuscripts from its archives in the edition Monumenta Iadertina. So far, the edition covered almost all known parish registries and monastic material from the territory of Zadar (arch)bishopric—a vast corpus of monuments written in the Glagolitic script (primarily its cursive variant) and the Croatian vernacular [99].

The Faculty of Economics and Business in Osijek and the recently founded Andizet Institute complement the landscape of contemporary Croatian glagolitism with their work on exploring new and innovative ways to communicate Glagolitic heritage. Their projects focus on combining art, science, and creative industries for the branding and interpretation of Croatian Glagolitic heritage, and designing solutions to use Glagolitic heritage as a powerful resource for projects involving circular economy, storytelling, and heritage interpretation [79, 100].

In Rijeka, the University library houses one of the rare permanent exhibitions of Glagolitic in Croatia. The newly founded "Typeflow Center" on occasions promotes the art of Glagolitic print, combining traditional and digital printing technology in youth education.

The city of Senj and its administration foster a tradition of collaboration between the municipal government, local enthusiasts, and academic institutions such as the Old Church Slavonic Institute. These collaborations aim to promote the city's rich Glagolitic past. Senj was one of the rare bishoprics who in continuity since the Middle Ages preserved the Glagolitic rite in the Cathedral itself [101, 102]. Senj was also the location of a Glagolitic printing press with its seven Glagolitic editions [102, 103].

The Istrian county, with its rich and diverse Croatian Glagolitic heritage and history, is a traditional leader in Glagolitic popularization and innovative forms of heritage communication. During the second half of the twentieth century, it was ahead of its time with its Glagolitic printing press in Roč and "Mala glagoljska akademija Juri Žakan Roč," as well as the cultural route "Glagolitic alley" created through a synergy and collaboration between academia and local communities and artists. The early 2020-ies saw difficulty in maintaining these programs caused by an inevitable interchange of generations, stressing the issue of continuing existing good practices and projects which often rest solely on the enthusiasm of individuals, with limited national, or even local support.

Krk island managed to uphold its millennial glagolitic tradition, partly due to the work and incentive of the Old Slavonic Academy operating in Krk at the start of the twentieth century. It continues its rich and proud tradition with new projects such as the "Baška Glagolitic alphabet trail" [104] and "The trails of the Frankopans" cultural route. Glagolitic-related activities are present in local schools and communities and promoted by tourist offices across the island. Summer schools for teaching glagolitic script to youths are also annually organized on Krk island.

The "Poljičica" script has been inscribed in the cultural register (reg. num. Z-7778). This initiative, though spearheaded by academics, is a good example of community involvement, support, and collaboration. The inscription has set the Poljica historical region on the map of contemporary centers of Croatian glagolitism. Church and monastic institutions are important stakeholders, especially Benedictine monks of Čokovac monastery and the Franciscans of the third orders—glagolites. These monastic communities continue their traditional role as patrons of local artists

and leaders of community-based efforts in preserving and safeguarding Glagolitic heritage. On the level of local parishes, depending often on the enthusiasm and preferences of local priests, liturgy is occasionally celebrated on the Croatian Church Slavonic language and accompanied by the traditional Glagolitic chant performed by local singers, as is the case on Iž island.

Faculty of the various departments of Croatian and Slavic studies, theology, and history, as well as the Academy of music, are instrumental in promoting interest among young students and educating generations of future researchers [105]. Hence, occasionally students of Croatian and Slavic studies, history, economy, art, and graphic design chose Glagolitic-related subjects for their thesis. These master thesis and PhDs offer new research approaches and perspectives, formulating new and inspired ideas for its communication as well as opening new interdisciplinarity approaches to understanding and promoting this unique and important part of Croatia's heritage.

The Glagolitic chant remains one of the rare segments of Glagolitic heritage which has been continually upheld by local communities, even after the liturgical reform of the Second Vatican Council, and whose archaic, unique, and locally specific melodies and singing styles can still be experienced as part of liturgy, especially during Lent, Easter, and Christmas in many parishes of Croatia littoral and the Dalmatian hinterland. The Glagolitic chant is defined as a "...unique liturgical and extra liturgical chant originating from sung texts of the Glagolitic liturgy based on liturgical manuals written in the Glagolitic script." ([90], p. 89). The Glagolitic chant was transmitted primarily orally, without notation, in communities of practice led by experienced male singers—kantaduri [106]. The Glagolitic chant 2008. (reg. num. Z-3620) and the Kantanje/singing of Planctus beatae Virgine of Imotski and Vrgorac region (reg. num. Z-7335) have also been inscribed in the Register. Dedicated to the promotion and preservation of the Glagolitic chant is a whole plethora of associations ("Pasionska baština" and "Pjevana Baština"), manifestations ("Puče moj"), vocal music ensembles ("Dialogos" vocal ensemble, "Baščina" choir, and the "Pučki pivači Katoličko bogoslovnog fakulteta") [107, 108]. The Glagolitic chant is also performed by LADO, the Croatian national folklore ensemble.

Exceptionally important for the preservation of the Glagolitic chant is the association and manifestation "Pasionska baština". It is dedicated to the revitalization and revalorization of Croatia's rich Lent and Easter period customs, traditions, and especially liturgical singing, text, and drama. Annual manifestations and activities include conferences, published editions, and live performances by choirs, singers, and performers from various local communities. The performances are often multimodal and combine elements of theatric stage performance, singing, choreography, and recitation of Croatian Church Slavonic and Old Croatian texts. This medieval tradition of folk liturgical drama had its echoes in modern Croatian theater (e.g., the work of Marin Carić, theater director), but has unfortunately been neglected in contemporary performances.

The systematic research of the Glagolitic chant was piloted by the Old Church Slavonic institute, in collaboration with the Academy of Sciences and the Music academy. Research was conducted from 1954 to 1975. The result of the project were several hundred recordings of folk Glagolitic chants, as well as a number of recorded interviews, folk songs, field research notes, etc. These recordings are the basis of the Fonoteka—audio collection of the Old Church Slavonic institute. Originally recorded on magnetofone roles, these recordings have been digitized and are available in open access *via* the "online repository of the Glagolitic chant" [109, 110]. Interested

researchers, choir leaders, members of local communities, and even family members of singers who were recorded often contact the institute in search for individual recordings or information. Remastering some of these recordings could aid in both researches, revitalization, and promotion of this rich and important part of Croatia's Glagolitic heritage.

The Old Church Slavonic Institute piloted a series of innovative and sustainable projects aiming at the promotion of both Glagolitic heritage and the Institute itself, with its 70 years of research of Croatian Glagolitic, to a broader, non-academic audience. Among the most noted projects are activities held during the Europeans researchers' night, virtual exhibitions (Missal of Prince Novak and Žgombić Miscellany), gamification of Glagolitic heritage and the design of educational video-games, the systematic use of social media for public engagement, as well as numerous activities conducted by the Scientific Centre of Excellence for Croatian glagolitism and the newly launched DigiSTIN project ("The Development of a model of digital infrastructure of the Old Church Slavonic Institute") [25, 111]. The main goal of the DigiSTIN project is the development and redesign of the stin.hr. domain into a focal point for the dissemination of Croatian Glagolitic heritage [112]. Among its goals are also enhancing the international visibility of Croatian science and promoting Glagolitic heritage on a global scale, through transnational networking and the design of innovative and high-quality content for the future "Interpretation center for Croatian glagolitism" and the European "Cyril and Methodius Route" [112].

6. Conclusion

Glagolitic heritage is an important part of Croatian culture and identity. The term Glagolitic heritage encompasses a broad and diverse spectrum of cultural phenomenon, linked primarily to Glagolitic literacy and liturgy, but also Croatian Cyrillic and Latin literacy. Understanding the full scope of Glagolitic heritage—the cultural and historic phenomenon which are encompassed under its term—is a prerequisite for the successful communication of this heritage to a wider audience. Knowing the range and diversity of monuments and practices included is important, especially considering the fact that a large part of this heritage—the corpus of Croatian Glagolitic written monuments—codices, documents, and fragments are located in national libraries, archives, and private collections around the world. For this reason, the creation of registries, digitization, and virtual forms of heritage presentation have an important role in its communication and safeguarding.

Contemporary practices of Glagolitic heritage communication, safeguarding and revitalization involve a wide array of stakeholders and practices. Though numerous actors—individuals, local communities, civil associations, and institutions—deal with the study, preservation, and popularization of Glagolitic heritage, we surmise that the factors which would contribute to the collaboration and participation of all stakeholders in the process of communicating and management of Glagolitic heritage have not been established and systematized. Dvorski states that: "Innovative communication encourages all stakeholders to effective communication and enables an original way of communicating. The space of innovative communication is shaped in an original and innovative way, and its structure represents a novel and higher level of understanding (interconnectedness) of stakeholders in the communication canal. These structures and ways constantly adapt to persons, institutions, and situations. The creative dialogue between employees changes the communication strategies. The

increased interest for innovative communication is linked to the increase of quantity and speed of the distribution of information's and knowledge" ([113], p. 51).

The purpose of this research will be to empirically study all factors which contribute to the active participation of stakeholders in original and innovative forms of Glagolitic heritage communication, primarily factors which (a) promote identification with Glagolitic heritage as a prerequisite for stakeholder engagement in processes of heritage management and communication, (b) encourage the engagement of all stakeholders (individuals, communities, civil associations, and institutions) and their collaboration in networking, (c) strengthens stakeholder capacities and communities for their active participation in heritage management and communication, and (d) encourages innovative and original forms of heritage communication. For this purpose, a Delphi study will be conducted [114, 115] and on the basis of expert opinions from the fields of humanistic and social sciences, art, and creative industries determines the factors which contribute to the active participation of stakeholders in original and innovative forms of Glagolitic heritage communication, which represent a higher level of understanding and interconnectedness of stakeholders, ensuring the long-term sustainability and preservation of Croatian Glagolitic heritage.

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Chapter 11

Wool Clothes and Mats in the Bronze Age and Medieval Burials in the Northern Caucasus Region

Natalia Kashirskaya and Alexander Borisov

Abstract

The method of keratin baits for estimating the number of wool-decomposing fungi was developed to detect the former presence of keratin-containing substrates in burials. The method was tested on soil samples taken under the skeletons from the burials of the Bronze Age and the Medieval time in kurgan cemeteries excavated in the North Caucasus, Russia. In each burial, the soil under the skull, spine, pelvis, knees, and feet of the buried were examined. In all burials, the number of colony-forming units of wool-decomposing fungi was higher than in the control samples of the upper layer of buried soils. A significant increase of colony-forming units of wool-decomposing fungi was found in the soils under the feet of skeletons in the burials of the Bronze Age. In burials of Medieval time, opposite, the low number of wool-decomposing fungi were found in the soil under the feet, and its high values were found in the soil under the spine. These differences may be due to the variation of the burial rituals in the Bronze Age and in the Medieval Age.

Keywords: keratinolytic fungi, wool textiles, biodegradation of wool, wool clothes, mats

1. Introduction

Wool items were widely used in the everyday lives of ancient populations and were inevitably used in funeral rites, but due to the microbial decomposition of wool in burial sites, the possibility of studying this aspect of material culture is limited [1]. Preservation of wool items is possible in frozen, dried, salted, or waterlogged conditions that are unfavorable for the biodegradation of organic material [2, 3]. Therefore, burials with preserved wool items are extremely rare.

Wool is a biopolymer of keratin (C39H65N11SO13), which can be assimilated by keratinophilic fungi [4–6]. Now, various analytical methods have been developed in archaeological studies of textile and leather products. These methods were adapted for archaeological purposes: to trace the origin of wool and understand the time of textile creation [7]. For the analysis of intact or lightly degraded wool fibers using simple microscopic methods—light microscopy (LM) with the use of dyes and light

stereomicroscopy [8]. If necessary, more complicated methods are used to determine the structure of hair or wool fiber at the nanometric level—scanning electron microscopy (SEM) [8–10] and atomic force microscopy (AFM) [10]. In various cases, successfully apply an extensive range of spectroscopic methods: synchrotron X-ray fluorescence micro-spectroscopy (μXRF) [10], Fourier-transform infrared (FTIR) spectroscopy [11–13], X-ray diffraction (XRD) [10, 14], X-ray microbeam diffraction and fluorescence [15], and X-ray fluorescence analysis using synchrotron radiation (SRXRF) [16]. For the analysis of dyes, we used absorption spectrophotometry [17] and high-performance liquid chromatography (HPLC) [18]. The isotopic analysis of archaeological wool uses in textile trade research [19]. Analysis of mitochondrial DNA (mtDNA) from sheep wool answers questions about ancient sheep breeds and sheep domestication [20]. Mass spectrometry-based peptide sequencing is applied to identify animal species used in the past for the production of leather clothing [21].

We have developed a microbiological approach for estimating the initial presence of wool items based on the number of keratinophilic fungi that decompose wool [22]. In this chapter, we present the results of determining the number of keratinophilic fungi in soils from graves from the Bronze Age and Early Medieval times excavated in the North Caucasus, Russia. Based on the results obtained, we estimate the frequency at which wool clothes and mats were used and discuss the possibility that woolen items were used to create roofs over gravel pits.

2. Theoretical basis of the research method

The baits method of estimating the number of wool-decomposing fungi (WD fungi) consists in the application of the suspension of the burial ground on a woolen textile disk. First, woolen textiles were treated with 36% hydrochloric acid and water steam in an autoclave, for rapid assimilation of the wool substrate by WD fungi and the formation of full-fledged fungal colonies within 4–7 days.

The methods of microbial cultivation on keratin-containing materials often used steam sterilization and milling of wool fiber [23]. However, these treatments were undesirable if it was necessary to save the original state of keratin to detect the fungal keratinolytic activity. In such cases, the use of organic solvents for wool sterilization was effective [24, 25]. Autoclaving, milling, and strong oxidation of wool fiber increased the microbial assimilability of this substrate. Thus, the culture of *Microsporum Gypseum* utilizes fully the wool, which was crushed in a mill and oxidized, and poorly uses whole wool fiber [23].

It is known that keratinolysis is happening first by destruction of disulfide bonds [26] and then by hydrolytic protein degradation and deamination [27]. It has been shown that *M. Gypseum* destroys disulfide bonds by sulfite released into the medium, and actinomycete *Streptomyces Fradiae* can perform enzymatic destruction of S-S keratin bonds [27]. However, all these mechanisms are carefully used. In the study of wool degradation by *M. Gypseum* it was found that its hyphae act first on the intercellular substance and grow between the cortical cells in parallel to the axis of the fibers. Hence, hardly assimilable keratin fibrils and cuticular scales remain relatively intact [28].

Changes in the structure of wool fibers treated with inorganic acids and water steam were studied by Crewther and Dowling. Treatment with 40% hydrochloric acid causes thermal super-compression of wool fibers in salt solutions due to the destruction of disulfide and peptide bonds, as well as changes in the configuration of keratin

Sampling location	Wool without acid treatment	Acid treated wool
Soil at the site of manure storage	—	14.49 ± 2.27
Soil of the cattle corral	—	10.11 ± 1.19

Table 1.
The number of wool-decomposing fungi colony-forming units in the top layer of modern soils ($^{*}10^{3}$ CFU/g).

molecules. Such modifications are due to the disordering of the protein structure, which can lead to rapid assimilation of the substrate by proteolytic enzymes [29]. Earlier, Goddard and Michaelis showed that oxidized, specially prepared wool was easily destroyed by proteolytic enzymes [30]. However, there are conditions that do not lead to extensive disordering of the keratin protein structure during acid treatment. Wool treated with HCl for 4 hours at 10°C was destroyed by trypsin weak. Even after treating the wool with 40% HCl for 18 hours at 30°C, only 2.62% of peptide bonds from their total amount in the initial material were hydrolyzed. At the same time, the number of groups -SS and -SH increased significantly [29].

Thus, treatment of wool with hydrochloric acid increases the availability of this substrate by WD fungi. In this work, non-crushed wool textiles were treated with 36% hydrochloric acid for 1 hour at 25°C. Autoclaved wool textiles without acid treatment were used as the control. To compare the microbial assimilability of experimental and control versions of wool textiles, the samples of the upper layer of modern Albic Phaeozem selected from cattle keeping areas were tested.

On the wool treated with hydrochloric acid, it was observed a rapid growth of the WD fungi colonies. In the upper soil layers selected from the cattle keeping area, the number of WD fungal CFU reaches 10–15 thousand CFU per g of soil. At the same time, on woolen disks without acid treatment, fungal colonies were not formed (**Table 1**).

3. The stages of the experiment

3.1 Preparation of woolen disks

Sections of 100% woolen textiles, 50–70 cm were treated with organic solvent hexane for 1 hour to remove lipid impurities. After drying, woolen textiles were treated with 36% hydrochloric acid at 25°C for 1 hour, washed repeatedly by water to a neutral pH, and autoclaved. Then woolen disks with a diameter of 90 mm on the diameter of Petri dishes were made. They were leveled by the iron and sterilized again in the hot cupboard at a temperature of 160°C for 3 hours. Independently, hexane-treated wool textiles were sterilized without acid treatment to assess the effect of autoclaving and dry heat on the assimilability of the wool substrate by WD fungi. The woolen disks made this way were moistened with sterilized water and placed in the sterile plastic Petri dishes.

3.2 Preparation of soil suspension

The soil sample of 1 g was placed in a sterile ceramic cup. One water drop (100–200 μl) was added to the soil sample from a flask with 100 ml of sterile water. The soil paste was obtained and crushed by the finger in the sterile glove to the complete

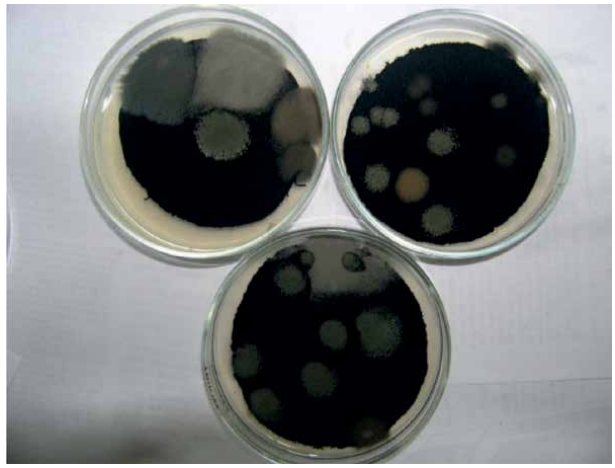

Figure 1.
Colonies of keratinophilic fungi on woolen disk in a Petri dish.

destruction of the structural units [31]. Then the soil paste was transferred quantitatively into the flask with sterile water. Soil suspension of II dilution (1 g of soil in 100 ml of water) was obtained. On the prepared woolen disk in a Petri dish, 1 ml of soil suspension was applied and leveled with a spatula. Petri dishes were closed and placed in the sterile plastic bags with a cotton bit impregnated with sterile water to maintain moisture.

3.3 Incubation of WD fungi and counting of fungal colonies

The growth of fungi on the wool substrate continued for 4–7 days in a thermostat at a temperature of 26°C (**Figure 1**). After counting the colonies of WD fungi on woolen disks, the number of CFU per 1 g of soil was calculated. The experiments were carried out in triple repetition.

4. Objects and methods

The objects of research were burials from the Early and Middle Bronze Age and Early Medieval times in kurgan cemeteries excavated in the North Caucasus, Russia.

To analyze the remains of clothes, soil samples were taken under the skull, spine, pelvis, knees, and feet of a skeleton. The soil in contact with soil-forming rock and the soil inside graves were selected.

To study the possibility that wool mats were used as funeral beds, soil from the bottom of burials outside the skeleton was sampled in a similar way. In addition, we took samples from the surface of wooden blocks in the ceilings above graves, which could sometimes be found in the burials. We assumed that woolen mats could have been placed on top of the wooden floor elements.

5. Results

A total of 75 samples of burials from the Bronze Age and 61 samples of burials from Early Medieval times were selected and analyzed (**Tables 2** and **3**).

Kurgan (K), Burial (B)	**The remains of the burial mats and overlaps**	**The number of keratinophilic fungi, $^{*}10^{3}$CFU/g**
Bronze Age, kurgan cemetery "Beysuzhek-35" Maikopskaya culture		
K.3 B.21	On the bottom of the burial	5.69 ± 1.72
K.3 B.22	On the overlap of the burial	38.61 ± 0.22
K.3 B.22	On the overlap of the burial	11.54 ± 0.80
K.3 B.22	Near the skeleton	6.45 ± 1.10
Bronze Age, kurgan cemetery "Beysuzhek-35" Yamnaya culture		
K.2 B.1	Darck colored mats remain from the bottom of burial	14.60 ± 0.53
K.3 B.8	White colored mats remain from the bottom of burial	18.42 ± 1.20
Bronze Age, kurgan cemetery "Beysuzhek-35" Novotitorovskaya culture		
K.3 B.19	Brown colored mats remain from the bottom of burial	55.81 ± 1.99
K.3 B.29	White colored mats remain	21.26 ± 0.96
K.6 B.6	White colored remain in 30 cm from the skeleton	9.58 ± 1.20
K.6 B.7	Yellow-brown mats remain near the elbow	24.00 ± 0.54
K.6 B.7	Brown mats remain behind the skull	14.24 ± 0.66
K.6 B.7	Pink overlaps remain on the bones	6.38 ± 0.57
Bronze Age, kurgan cemetery "Beysuzhek-35" Catacomb culture		
K.4 B.9	Black mats remain in front of the skeleton	19.41 ± 1.10
K.6 B.15	Brown colored remains behind the skull	24.93 ± 0.68
Early Medieval Time (alanian culture), kurgan complex "Bratskie kurgani"		
B.1378	Gray-white mats remain on the bottom of the burial	17.21 ± 0.52
B.1443	Dark gray mats remain on the bottom of the burial	14.21 ± 0.77
Early Medieval Time (alanian culture), kurgan complex «Oktyabrsky»		
B.777	Mats remains in the southern part of the burial	5.96 ± 0.31
B.805	Mats remains in the eastern part of the burial	33.62 ± 2.46
B.805	Mats remain under the pot	21.44 ± 0.57
Early Medieval Time (alanian culture), kurgan complex "Kievsky"		
B.1063	Mats remains in the eastern part of the burial	31.15 ± 0.75

Table 2.
The number of the keratinophilic fungi in the residues of keratin-containing mats and overlaps from burials of the Bronze Age and early medieval time.

Keratinophilic fungi were not detected in the control sample of buried soil. **Figure 2** shows the examples of mat remains in the burials of the Bronze Age (kurgan cemetery "Beysuzhek-35"), where high numbers of keratinophilic fungi colonies were

	Soil sampling location under the skeleton				
Burial	**Skull**	**Spine**	**Pelvis**	**Knees**	**Feet**
Bronze Age, kurgan cemetery "Beysuzhek-35", kurgan 6					
6	0.60 ± 0.05	0.23 ± 0.08	3.03 ± 0.33	1.55 ± 0.50	23.61 ± 0.63
7	23.83 ± 1.95	23.93 ± 0.12	24.51 ± 0.25	26.20 ± 3.63	32.06 ± 5.19
8	4.71 ± 1.30	2.02 ± 0.24	1.26 ± 0.04	1.26 ± 0.13	0.52 ± 0.07
15	4.42 ± 0.10	0.58 ± 0.10	6.65 ± 0.99	6.17 ± 1.23	34.18 ± 5.09
Archaic Time, cemetery "Wolna-1"					
676	26.69 ± 2.50	0.28 ± 0.13	8.82 ± 1.10	0.57 ± 0.05	—
677	1.39 ± 0.00	18.26 ± 1.70	1.83 ± 0.28	27.10 ± 1.93	2.50 ± 0.09
678	8.79 ± 0.52	16.63 ± 1.79	8.50 ± 1.36	6.88 ± 0.67	3.47 ± 0.11
679 (1)	5.95 ± 0.31	10.98 ± 0.37	2.04 ± 0.13	10.28 ± 0.22	4.01 ± 0.74
679 (2)	8.96 ± 0.69	1.97 ± 0.29	0.53 ± 0.21	8.49 ± 0.35	1.30 ± 0.59
680	5.94 ± 0.66	2.98 ± 0.21	7.31 ± 0.22	2.47 ± 0.68	—
681	0.43 ± 0.11	1.94 ± 0.09	1.20 ± 0.46	8.34 ± 1.58	4.87 ± 0.65
Early Medieval Time, kurgan cemetery «Bratskie»					
1373	7.94 ± 1.19	8.12 ± 0.70	3.33 ± 0.43	20.74 ± 3.45	5.41 ± 0.64
Early Medieval Time, kurgan cemetery "Oktyabrsky»					
777	0.04 ± 0.04	0.11 ± 0.11	—	0.07 ± 0.04	—
780	1.16 ± 0.35	5.85 ± 0.58	0.07 ± 0.07	0.00 ± 0.00	0.07 ± 0.04
805 (1)	0.00 ± 0.00	0.00 ± 0.00	0.00 ± 0.00	0.06 ± 0.00	0.00 ± 0.00
805 (2)	0.04 ± 0.04	—	0.00 ± 0.00	0.00 ± 0.00	0.87 ± 0.22
842 (1)	7.16 ± 0.36	15.19 ± 0.57	17.48 ± 1.14	10.72 ± 1.27	11.30 ± 0.20
842 (2)	6.94 ± 0.57	20.57 ± 0.94	10.54 ± 1.31	10.79 ± 0.85	8.07 ± 0.61
Early Medieval Time, kurgan cemetery "Kievsky"					
1063	1.25 ± 0.24	6.43 ± 0.22	0.33 ± 0.13	0.47 ± 0.19	0.36 ± 0.16

Table 3.
*The number of the keratinophilic fungi (*10^3 CFU/g) in the grounds under the skeletons from the burials of the Bronze Age, Archaic Time, and Early Medieval Time.*

found. In this group of samples, the maximal abundance of keratinophilic fungi was found in the brown remains of mat from the burial № 19, kurgan № 3, novotitorovskaya culture (**Figure 2C**).

Figure 3 shows the examples of mat remains in the burials of Early Medieval Time (kurgan cemetery "Oktyabrsky", Alanian culture). Here, the largest number of keratinophilic fungi was found in burial 805 (**Figure 3B**).

Figures 4 and **5** show sampling locations that we believe contain remains of clothing or footwear from the buried individuals. In this group of samples, the largest abundance of keratinophilic fungi were found under the feet, which may indicate the use of wool-felted shoes. In the remains of mats (**Figure 4**), the number of keratinophilic fungi was 1.5–2.5 times less than in the samples under the feet.

In the samples under skeletons from burials of the Early Medieval Time, the number of keratinophilic fungi was quite high and evenly distributed, which may indicate the presence of woolen clothing (**Figure 5**).

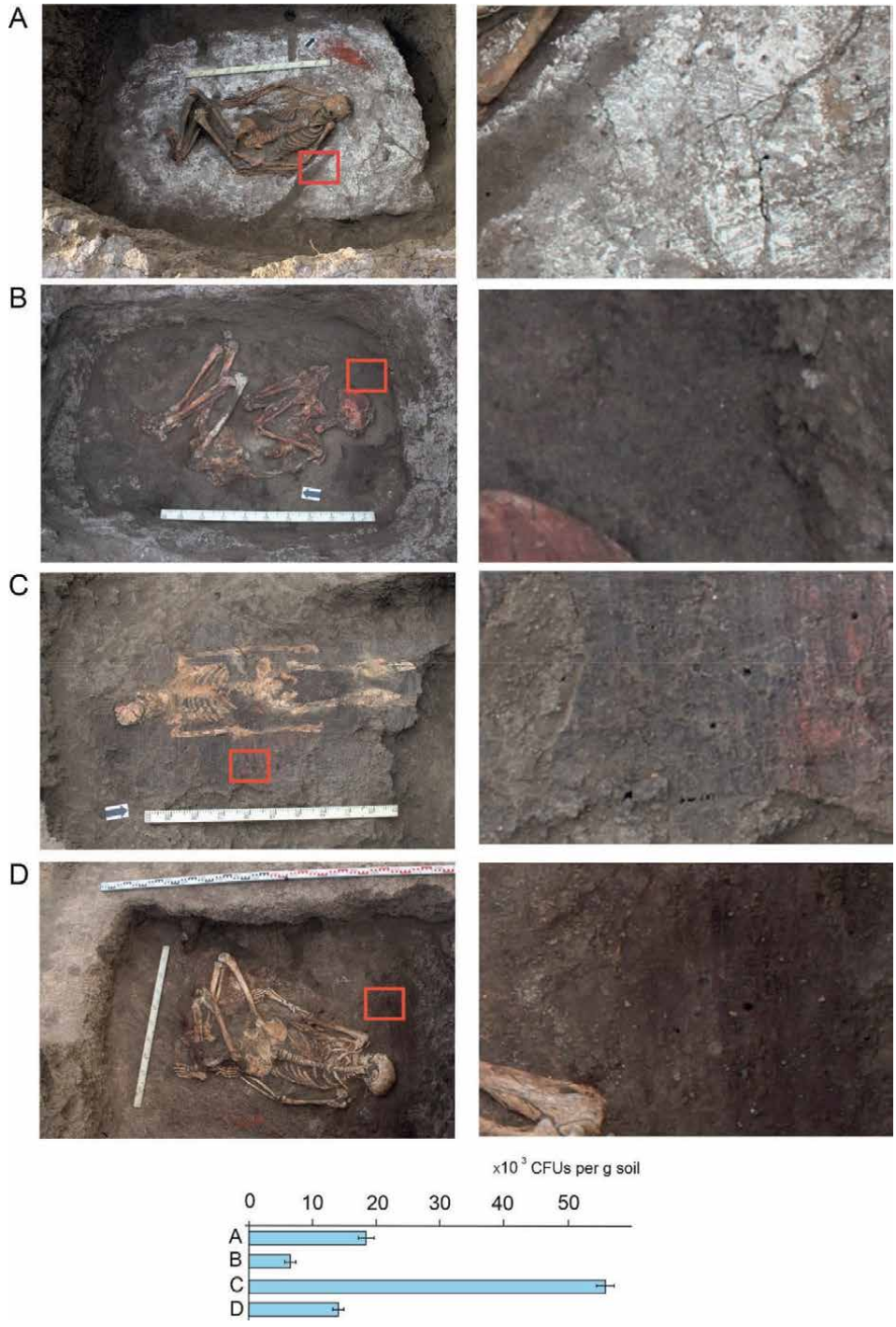

Figure 2.
Bronze Age, kurgan cemetery "Beysuzhek-35." The number of keratinophilic fungi in the remains of mats. A – kurgan 3, burial 8, Yamnaya culture, B– kurgan 3, burial 22, Maikopskaya culture, C – kurgan 3, burial 19, Novotitorovskaya culture, D – kurgan 6, burial 7, novotitorovskaya culture.

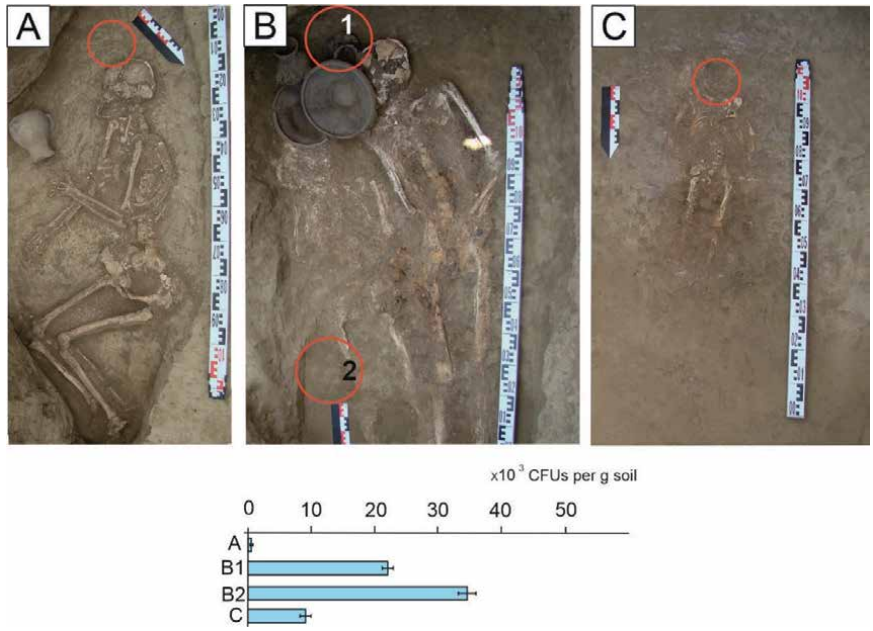

Figure 3.
Early Medieval Time, kurgan cemetery "Oktyabrsky", Alanian culture. The number of keratinophilic fungi in the remains of mats in the eastern part of the burial chamber of the burial 780 (A), under the vessels of the burial 805 (B1), in the eastern part of the burial chamber of the burial № 805 (B2), in the southern part of the burial chamber of the burial 777 (C).

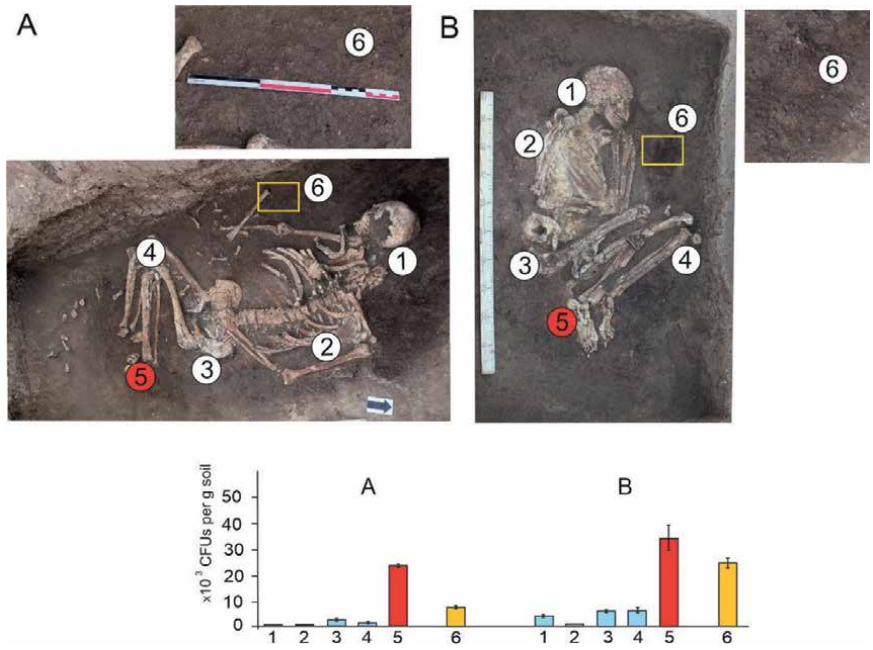

Figure 4.
Bronze Age, kurgan cemetery "Beysuzhek-35". kurgan № 6. The number of keratinophilic fungi in the grounds under the skeleton (1–5) and in the remains of mats (6). A – burial № 6, novotitorovskaya culture, B – burial № 15, early catacomb culture.

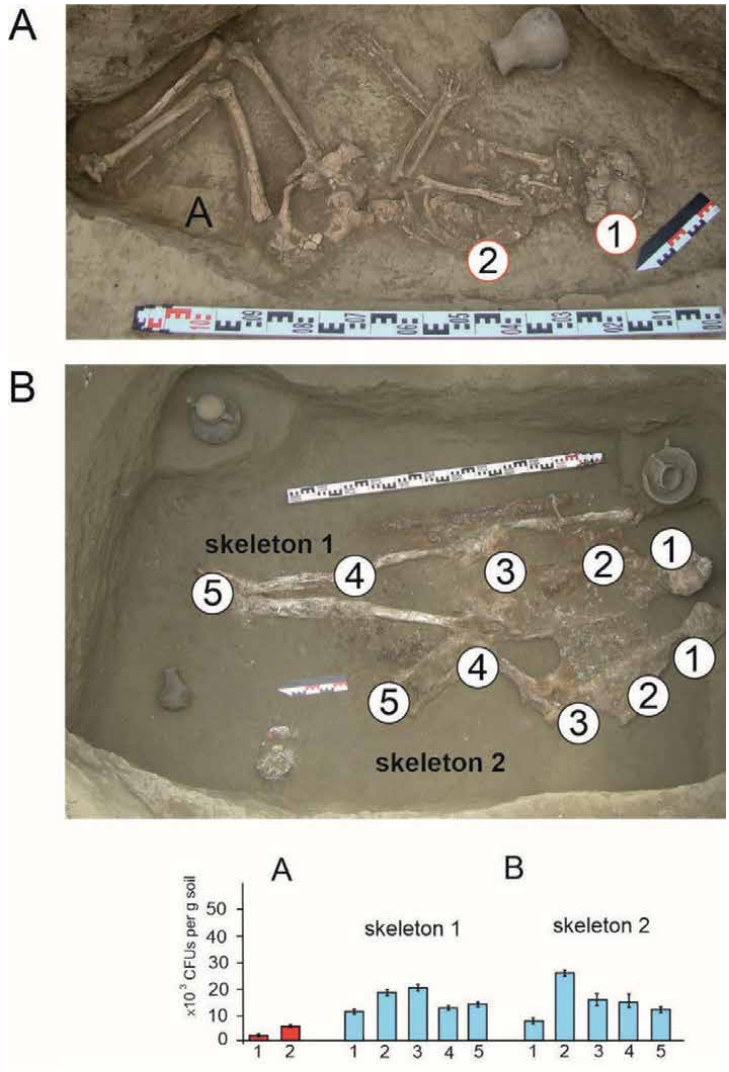

Figure 5.
Early Medieval Time, kurgan cemetery "Oktyabrsky", alanian culture. The number of keratinophilic fungi in the grounds under the skeletons. A – burial № 780, B – burial № 842.

It is worth noting that both in the burials of the Bronze Age and in the medieval burials, the number of keratinophilic fungi in the soil under the skull is always the lowest. This is typical for both female and male burials. This allows us to raise the question of the "hairstyle" of ancient peoples. According to the data obtained, there is no reason to talk about long hair in buried individuals. Obviously, hair was regularly cut for esthetic or hygienic reasons.

Figure 6 shows the distribution of the keratinophilic fungi in samples where such fungi were detected at the level above 1.5 thousand colonies per gram of soil. Box plot diagrams were used for statistical data processing [32].

The Bronze Age burials were characterized by a greater variation in the CFU of keratinophilic fungi than were the burials from Early Medieval times. The maximum of keratinophilic fungi in soils containing the remains of various objects was 1.5 times

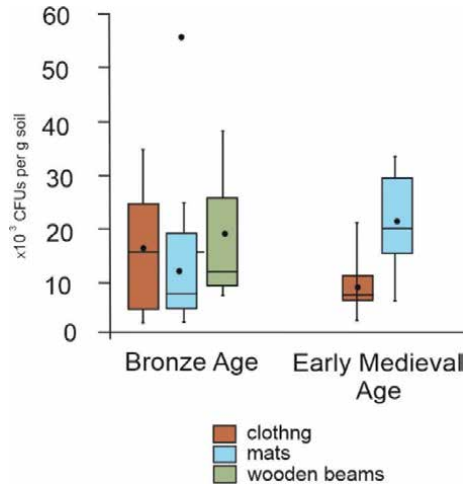

Figure 6.
Distribution of the keratinophilic fungi in the remains of mats and remnants of clothing in burials from the Bronze Age and Early Medieval Time.

higher in the Bronze Age burials than in the medieval burials. However, in most cases, the number of keratinophilic fungi in the remains of mats from medieval burials was higher than in similar samples from Bronze Age burials.

In the Bronze Age burials, in some cases, the maximum of CFU of keratinophilic fungi were recorded under the feet of the buried individual, which may indicate the presence of felted shoes. In one burial, high keratinophilic fungal counts were recorded both in all soil samples taken under the skeleton and in samples of mats taken outside the skeleton. Apparently, in this case, a felt mat was used.

In the soil samples from the medieval burials, no significant increase in the keratinophilic fungi in the soil under the feet was revealed. Burials from this time are often characterized by similar counts of keratinophilic fungi under different parts of the skeleton. This may indicate either the use of a woolen cloth or a shroud.

6. Conclusion

A new baiting method for the detection of the former presence of wool in ancient burials was proposed. The method is based on the estimation of the number of colony-forming units of wool-decomposing fungi in the ground under different parts of the skeleton. The method is tested on soil samples from burials of the Bronze Age, Archaic, and Medieval times. In all burials, the number of WD fungi was higher than those in control ground samples from upper layers of soil buried under the kurgan mounds.

The traditions of using wool products in the clothing of the deceased and in the decoration of a burial bed differed in the Bronze Age and in the early Middle Ages. In the burials from the Bronze Age, the "keratin trace" was detected more often and was more pronounced than in the burials from Early Medieval times. However, in the medieval burials, there was a higher frequency of occurrence of a weak "keratin trace." We believe that the degree of intensity of the keratin trace in burials may be related to the thickness and density of wool products. Apparently, burials from the

Bronze Age are characterized by products of coarser workmanship than burials from Early Medieval times.

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Conflict of interest

The authors declare no conflict of interest.

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Chapter 12

Metal Cultural Treasure of the Ottoman: Talisman Seals

Şerife Tali

Abstract

This study examines 15 Ottoman period metal talisman seals selected from Anatolian museums (Sinop, Ankara, etc.). Talisman seals are therapeutic artifacts produced to protect against the evil eye or diseases and to fulfill various wishes. Among the Ottoman seal artisans, the Esnaf-ı Mühürkünân-ı Sim Heykel group engraved such important talismans in the form of seals for healing purposes. When the talisman seals are examined, it is seen that for different requests, verses from the Qur'an, various prayers, four angels, Khidr Ilyas, the names of the Seven Sleepers and religious elders, vefks, Seal of Süleyman motif, seven seals and other symbols that strengthen the talisman are engraved. Handmade seals, which are carried hidden on the person and are a kind of amulet, are inked and printed on paper. Especially, the more esoteric nature of the contents written with vefk suggests that the seals may also have been produced for negative contents. In addition, symbols (Hand of Fatima, Zülfikar) and contents specific to Alevi-Bektashi culture are frequently used in the works.

Keywords: ottoman, museum, talisman seal, healing, amulet

1. Introduction

Talismans are used in the sense of remedy, precaution, charm and magic, which is believed to carry a mysterious and powerful force [1]. The word 'talisman' used in Arabic as '*tılesm, tıllesm, talsem, talism, tıllism, tılsim means an object with supernatural powers, some secrets, a knot that cannot be unraveled, a hidden and closed word*.' The word 'talisman' came from Arabic to Western languages; it means 'Amulet' in Latin [2]. In Turkish, it corresponds to the concepts of 'phylactery(hamail), enchantment(efsun) and magic (sihir)'. Talismans, which are understood to have been used since ancient times, are carried out in general for the protection of people or living spaces. Throughout history, people have been producing talismans for the spiritual protection of those they care about (their children, animals, dead). Talismans can be made for different purposes, such as the preservation of treasure, conversation, dismissal and access to a secret [3, 4]. However, there are such talisman forms that have been found that it is difficult to understand the purpose for which they were made, even from what is written in the talisman [5]. Talismans, as a purely folk culture, may vary according to the regions, the people who make the talisman and the way they are used.

It is known that in Sumerian and Assyrian-Babylonian culture, talismans were made of stone or metal, in the form of hands or moon figures, round shapes, and hung on the neck, arm and houses. The most common objects used for talisman purposes in ancient Egypt *are the 'eye of horus, dirt beetle figures, and Isis Figurines' made of stone or metal*. The first reference to talisman objects in the Old Testament is the protective figures in Deuteronomy (6,8–9 and 22:12). There is information that objects with talisman properties are mostly made of iron, assuming that they have the quality of being metal, which separates the secular and otherworldly realms. The most common Jewish talisman from antiquity to the present day is the Mezuzah, which is usually hung on the top of doors. In Christianity, there are not many references to talismans in the New Testament or early Patristic literature. The forms of talismans that have become widespread since the Middle Ages are cross motifs. The horseshoe and four-leaf clover motifs, which are common in Anglo-Saxon and Germanic peoples, mostly reflect the local tradition [6]. In the Islamic world, talismans were generally produced from religious writings and shapes. Even if it is debated whether they are compatible with real religious values, it is certain that their justifications and the sources on which they claim to be based are based on religion. Talisman seals, which are one of the protective talismans, are mysterious artifacts that are produced similarly to each other, despite their special workmanship, and contain passwords on them. Due to the lack of space and the desire to add mystery, encryptions and abbreviations are used. Talisman seals do not have a representative feature, but in the Islamic period, religious phrases with only protective properties are seen on personal seals without writing a name [7].

Talismanic seals/stamps [8] are seals with religious inscriptions and protective properties. These seals, which are a kind of amulet, are inked and printed on paper, and more often religious philosophy framed as talismanic signs with prayers and verses without pictures [7]. The first example of the talisman seal is the magic signet ring of the Prophet Solomon with the Seal of Suleiman motif (six-pointed star). The six-pointed star motif is one of the most commonly used talisman signs in different religions or cultures. Among Muslims, it is called 'Hâtem-i Süleyman' and by Jews and Christians as 'Star of David' [9]. It is believed that the Prophet Solomon controlled supernatural powers with his ring and was at the disposal of all wolves, birds, humans and demons. For this reason, the seal of Prophet Solomon has been seen as a very powerful talisman to protect against all kinds of dangers, misfortunes and evil since ancient times [10]. The earliest of the talismans is A.D.1–2. It is known that their engraving on stone has become widespread since the first century [11]. In order to protect against talismans, evils and the evil eye, they were used in the Greek, Roman, Egyptian, Byzantine [12] and Ottoman periods. It has an important place. Talismans became a tool used in the form of seals in the Ottoman Empire [7, 13].

Sealing as a branch of Ottoman art; Calligraphy is a very strong and difficult branch that includes the art of fairness and decoration. A good sealer must first be a good calligrapher, and then he must be able to skillfully engrave the line in a small area on the mine with the same care, contrary to the same care [14–16]. Ottoman talisman seals have been done in order to protect against evil, to ensure that wishes and expectations are met, to be successful, to avoid the evil eye and evil spirits. In addition to various religious contents from hidden powers, they also include figures and signs that will be useful in a symbolic sense [17]. Ottoman talisman seals have talisman features in terms of construction techniques, types, reverse engraving of the inscriptions, and the way they are used, the inscriptions and shapes on the seal. Within the Ottoman Seal Tradesmen, the Esnaf-ı Mühürkünân-ı Sim Heykel group

engraved such important talismans in the form of seals for healing purposes [7]. On these types of seal, we find various prayers for different requests and expectations, as well as different symbols for various talisman purposes, such as vefks consisting of numbers and letters [18]. Buduh, Seal Süleyman motif, Khidr Ilyas, Companions of the Prophet and seven seal symbols are engraved. They cover sciences, such as science sihr, scholastic science, science alchemy, science ahkâm-ı nücum (astrology), science zayirçe and science vefk [13].

In this study, 15 samples selected from talisman seals belonging to the Ottoman Period from the Anatolian cities of Amasya, Ankara, Diyarbakır, Elazığ, Erzurum, Malatya, Sinop and Tokat Ethnography Museums are examined. The specimens, which constitute an important part of the Ottoman cultural heritage and memory, are preserved in warehouses and very few of them are exhibited. Each of these artifacts, which are brought to museums through purchase, constitutes unique examples of tangible cultural heritage. After the necessary technical permissions obtained from the museums, photographs of the works were taken, measurements were taken, and detailed readings and studies were carried out on photographs. Care has been taken to ensure that the selected samples are of different contents and shapes. By reading and examining the verses, prayers, names and figures written on them; in the Ottoman culture, it was tried to reveal the acceptance of the society with the variety of talismans they produced in order to get rid of physical or mental diseases or supernatural forces and to meet various expectations. Each artifact examined is handled within the framework of the protection and comprehensive healing properties of the specific talisman. It is possible that the talisman seals, the purposes of which are not specified, have contents such as opening up someone's relationship, falling in love, finding treasure, doing evil, etc., with abjad [19] or vefk [20] schemes, the contents of which cannot be fully deciphered, apart from the purpose of protection. It is expected that the talisman seals, which were introduced for the first time in this publication, will make a very important contribution to the literature and bring them to the tangible cultural heritage. The study is discussed under three main headings. Introduction, catalog: charm seals and reviews.

2. Catalog: talisman seals

It is seen that there is a widespread use of talisman seals in Ottoman seal art with their rich content, various types and generally large scales. The people continued to use them to protect themselves from diseases and disasters, to make certain wishes come true and to protect themselves from magic and evil. All of the 15 talisman seals, which will be scientifically unearthed for the first time with this study, are originally handcrafted pieces from the Ottoman period. Fifteen talisman seals, which are unique and rich examples of the Ottoman period, are listed. They are introduced by giving the location, work number, size and material information. Underneath each talisman seal photograph; figures, texts, verses, figures and symbols are read. The content of the seals is read by the researcher/author.

In the production of Ottoman talisman seal samples, the mold casting technique was generally applied, and brass, copper and bronze were used as materials. In terms of workmanship, calligraphy, decoration and frames on the works were carried out by carving and engraving at different depths. The texts on the seals are completely engraved by hand and backwards, so that they come out flat when printed on a hard background. The contents of the talisman seals are Arabic, Ottoman Turkish and

apart from these languages, different symbols dating back to Ancient times were also used. Symbols in which messages or requests are encrypted have been used, instead of symbols, words or phrases of various characters produced from Kabbalistic alphabets that have been used since ancient times [21].

2.1 Amasya museum, inventory No: F.66.34.7, 41x2 mm, Brass

See **Figure 1**.

Description: The surface of the single-sided talisman seal in the form of a circle is divided into four asymmetrical borders. Surah al-Baqarah 255., which starts from the outermost border of the stamp and is completed in the center with nasta'liq calligraphy without Basmala. His verse (Ayat-al-Kursi) reads: "*Allâhu lâ ilâhe illâ hüvel hayyül kayyûm lâ ta'huzuhu sinetun walâ nawm, lehu mâ fissemâvâti ve mâ fil'ard men zellezî yeshfeu indehû illâ bi'iznih ya'lemü mâ beyne eydîhim vemâ halfehüm walâ yühîtûne bi'şey'in min ilmihî illâ bimâ şâe vesia kürsiyyühüssemâvâti wal ard walâ yeûdühû hifzuhümâ ve hüvel aliyyül azîm*". The handle of the talisman seal is in the form of a fixed and stylized palmette.

2.2 Sinop ethnography museum, inventory No: 14.5.78, 54x3 mm, Brass

See **Figure 2**.

Description: The surface of the single-faced talisman seal in the form of a circle is divided into two parts by a border on the outside. The center of the seal is engraved with a stylized pair of fish figures, with differences in the body and mouth. On the figure on the right, "*yâ Kâfi (O Almighty)*", and on the figure on the left, "*yâ Shafi (O healer)*", 'al-Asmâ' al-husnâs engraved. Surah Isra, which is a healing verse with thuluth calligraphy on the border, is 82. The verse reads: "*Ve nunezzilu minel Qur'âni mâ huve şifâun ve rahmatun lil mu'minîna velâ yazîduz zâlimîne illâ hasârâ*". The handle of the talisman seal is fixed and stylized in the form of a palmette.

2.3 Ankara ethnography museum, inventory No: 7340, 55x3 mm, Brass

See **Figure 3**.

Description: The circumference of the single-faced talisman seal in the form of a circle is bordered by a double-contoured erasure, and a stylized animal figure with

Figure 1.
Talisman seal no. 2.1.

Figure 2.
Talisman seal no. 2.2.

Figure 3.
Talisman seal no. 2.3.

its pointed tail-wings-antennae and the round body is engraved in the middle. Surah Isra, which begins with Basmala with a thuluth line in the antenna part, is 82. His verse is written in parts. From the body of the animal, to be completed in the center, Surah Yasin 9.th Verse reads: "*Ve cealnâ min beyni eydîhim sedden ve min halfihim sedden fe agşeynâhum fehum lâ yubsırûn*". The handle of the talisman seal is fixed and triangular in shape.

2.4 Malatya Beşkonaklar ethnography museum, inventory No: 1727, 84x4 mm, Brass

See **Figure 4**.

Definition: A square vefk of 4x4 = 16 is formed asymmetrically in the center of the single-sided talisman seal in the form of a circle. Square vefks in boxes consisting of quadruple numbers are connected with "*Bismillâhi'rrahmâni'rrahîm*" with nasta'liq calligraphy. The names of the four great angels are inscribed around the square as "*Gabriel and Michael and Israfil and Azrael*", beginning with "*bi reverence*". Vefk is circularly placed from the outside in the corners of Surah Anam 73. His verse (in part): *Wrapping it again with "Lehu l-Mulk ve gavleh ul-Hak*" and "*al-Haqq*" on the four sides with "*al-Bible, az-Zabur, Abd al-Quran, al-....?*" the names of the holy books are engraved. The handle of the talisman seal is fixed and oval in shape.

Figure 4.
Talisman seal no. 2.4.

2.5 Sinop ethnography museum, inventory No: 14.3.78, 55x3 mm, Brass

See **Figure 5**.

Description: The surface of the single-faced talisman seal in the form of a circle is divided into seven sections by six borders varying in width around the center. The inner parts of the horizontal borders are divided again by vertically cut lines, except for the center. With the pattern called Cennet-ül Asmâ or Felek-ül Asmâ [22, 23]. In the center of the seal, with a square vefk consisting of 4x4 = 16 numbers with nasta'liq calligraphy, Masallah...? The wording is engraved. The first intrinsic border on the talisman seal is Surah Taha 111. His verse (in part): "*Anetil vucûhu lil hayyil kayyûm*"; on the second border, "*Adl, Kuddûs, Ferdun, Hayy, Kayyûm, Hukmûn*"; on the third border, "*Bismillâhirrahmânirrahîm*"; on the fourth border, symbols of Ancient Abjad; on the fifth border, "*al-Mulk, al-Azîm, al-Cabbar, al-Mutekebbir, al-Muhaymin, al-Kâdir, al-Aliyy, al-Kabîr, al-Mutuâlî, al-Kahhâr, al-Fattâh, al-Hakîm, al-Adl, al-Hayy, al-Hekim, al-Azîz, al-Habîr, al-Munezzil, al-Mustakîm*" 'al-Asmâ' al-husnâs; on the sixth border, Surah al-Baqarah 255., which begins with Basmala his verse has been written. The handle of the talisman seal is fixed and shaped by volutes.

2.6 Amasya museum, inventory No: F.67.19.3, 50x50x2 mm, Brass

See **Figure 6**.

Definition: A square vefk of 5x5 = 25 has been created on the surface of the single-sided talisman seal in square form. In the first line of the square with the nasta'liq calligraphy, the 1.st verse of Surah Maryam. Verse reads: "*Kâf, hâ, yâ, ayn, sâd*" and the 1.st and 2.nd verses of Surah Shura, the verse reads: "*Hâ-mîm-ayn-sîn-kâf*". In the square vefk, each of the letters of the same verses is arranged in a different order in the following lines and the vefk is completed. The numbers are written around the square vefkin in the center. The handle of the talisman seal is added to the body later and is ring-shaped.

2.7 Diyarbakir museum, inventory No: 10/2/87, 23x23x2 mm, bronze

See **Figure 7**.

Definition: A square vefk consisting of 5x5 = 25 numbers is created in the center of the talisman ring seal in square form. The square vefk in boxes consisting of numbers

Figure 5.
Talisman seal no. 2.5.

Figure 6.
Talisman seal no. 2.6.

Figure 7.
Talisman seal no. 2.7.

is connected with "*Bismillallâhi'rrahmâni'rrahîm*" with nasta'liq calligraphy. In the upper corners of the vefkin is Surah Anam 73. The verse (in part): "*Lehu al-mulk ve gavleh ul-Hak*" was stacked, while the names of the four great angels were written on the edges of the square vefkin: "*Gabriel, Michael, Azrael, Israfil*". The inside of the square in the center of the talisman seal is left "blank" so that different wishes or requests can be rewritten. It is understood that after the space in the center is arranged according to the person, the pressure is carried out repeatedly.

2.8 Amasya museum, inventory No: F.84.41.1, 25x33x4 mm, Brass

See **Figure 8**.

Description: A single-faced talisman in the form of an eye is placed on the surface of the seal with nasta'liq calligraphy, at the top; the phrase *"yâ Allah"* is at the bottom; A different version of the seven seal symbols and the 'al-Asmâ' al-husnâ *"yâ Hafiz (O Protector)"* were engraved in the continuation. Afterwards, ع ع ع ع in the lower two lines with the content consisting mainly of numbers and not fully deciphered was written. The handle of the talisman seal was added to the body later and is broken.

2.9 Tokat museum, inventory No: 76.16.23, 33x3 mm, Brass

See **Figure 9**.

Description: On the surface of the single-faced talisman seal in the form of a circle, with nasta'liq calligraphy to form the seal of Süleyman motif, the names of the Seven Sleepers and their dogs. It was written "*Yamlīhā, Makslīnā, Maslīniyā, Marnūs, Dabarnūs, Shadnūsh, Kafshatītūs, Qitmīr*". In the center of the motif, the 'al-Asmâ' al-husnâ of "*yâ Hafîz (O Protector)"* is engraved. The handle of the talisman seal is fixed and stylized in the form of a palmette.

2.10 Erzurum Yakutiye ethnography museum, inventory No: 9: 43-75, 81x3 mm, copper

See **Figure 10**.

Description: On the surface of the one-sided talisman seal in the form of a circle, 15 lines of text consisting of verses, prayers and talismans are written in free nasta'liq calligraphy. In the first line, the numbers are 9, 0, 6, 9, 2, 6, 90, 1: 1 + 2 + 3: 6 = vav = "Allah"; The letters of the second line of seven symbols are followed by Surah Maryam 1. Verse: "*Kâf-hâ-yâ-ayn-sâd";* Surah Shura 1. and 2. Verses: "*Hâ-mîm-ayn-sîn-kâf*"; again, with the letters of the seven seal symbols, *...? yâHalas'u'l alâ as-sahib-ul-makân ve bil hakki bi hurmeti, yâ Su yâ iman yâ Dâfi' yâ Râfi' ezzuluma't"* Surah Yasin 58. Its verse: "*Salâmun gavlen min Rabbir Rahîm"; "ve bi-hakki ve bi-hurmeti*" *bi-hakki ve bi-hurmeti*" "*ani-sa't alaikum,* Surah al-Rahman 33. Verse (in part): *"yâ ma'sarel cinni vel ins" ve ilal arvahi'l hatemi min Sulayman ve bi-hakki ve bi-hurmati lâ ilaha iIllallah hayr-ul-halâs Muhammad'un Rasulullah "Khidr Ilyas" Ahrac Hazihi ..? Assev-diye'h ve-l insiye'h ve ilahi ..? vel berriya'h ve-sh şeydaniye'h*"; Surah Anam 13. Its verse: "*An-nazara kam Ahrac filleyli ve-nnehari ve hüves-semiul alim", "ve bi-hakki ve bi-hurmeti*"; Surah Yusuf 64. Its verse

Figure 8.
Talisman seal no. 2.8.

Figure 9.
Talisman seal no. 2.9.

Figure 10.
Talisman seal no. 2.10.

(in part): "*fallahû hayrun hafizen ve huvar-rahmanirrrâhimîn*"; Surah Buruj 20. Verse: "*Vallâhu min ve verâihim muhîtun*"; Surah Buruj 21. Verse: "*bel huva Qur'anun Mecîd*"; Surah Buruj 22. Its verse: "*Fi levhin mahfuz*"; "*Allahumma hifzuhunne ihfeze*"; Surah Al-Imran 104. The verse reads (in part): "*ve ulaikah humu lmuflihun*". The handle of the talisman seal is in the form of a bow that makes volutes attached to the body later.

2.11 Sinop museum, inventory No: 14.4.78, 54x3 mm, Brass

See **Figure 11**.

Description: The circumference of the single-faced talisman seal in the form of a circle is bordered by a double-contoured erasure and its surface is divided into two parts. The six-armed seal of Süleyman motif is engraved in the center of the talisman seal, and on the arms of the thulus calligraphy motif; "*Allah, Muhammad, Alîm, Hakîm, Kebîr, Kerîm*" 'al-Asmâ' al-husnâs *and* the edges of the star; "*Allah, Muhammad*" and the names of the four angels *are written "Gabriel, Michael, Israfil, Azrael"*. Surah Naml Verse 30., which begins with Basmala in the center of the motif of the Seal of Suleyman, reads: "*İnnehu min Suleymâne ve innehu Bismillâhirrahmânirrahîm*". The content was completed *by writing the words* "*Lâ ilâhe*

Figure 11.
Talisman seal no. 2.11.

illallâhül melikul hakkul mubîn Muhammad'un Rasûlullâhi sâdikul va'dil emîn yâ Allah yâ Muhammad" on the border that turned the talisman seal. The handle of the talisman seal is fixed and stylized in the form of a palmette.

2.12 Malatya Beşkonaklar ethnography museum, inventory No: 4, 120x5 mm, Brass

See **Figure 12**.

Description: The talisman seal, which is in the form of a circle and the edges of which are arranged in the form of a flower with 12 slices, is framed by an outer erasure. The surface of the seal is divided into five sections by four asymmetrical borders. The word "Allah" is written in the center of the thulus calligraphy, *and the 255.th verse of Surah al-Baqarah*, which begins with the Basmala around it. It is written in Surah al-Ikhlas without Basmala: "*Gul huwallâhu ahad, Allâhu's-samed, Lem yelid ve lem yûled ve lem yekûn lehû kufuven ahad*". The content is completed by writing the names of the Twelve Imams in each slice around the *talisman seal: "Imam Ali, Imam Hasan, Imam Husseyin, Imam Zayn al-Abidin, Imam Muhammad Baqir, Imam Jafar*

Figure 12.
Talisman seal no. 2.12.

es Sadiq, Imam Musa Kazim, Imam Ali Reza, Imam Taqi, Imam Naki, Imam Ghulam Askeri, Imam Mahdi". The handle of the talisman seal is fixed and oval in shape.

2.13 Ankara ethnography museum, inventory No: 18455, 140x3 mm, Brass

See **Figure 13**.

Description: The one-faced talisman seal in the form of Zulfiqar symbolically represents the sword of Hazrat Ali. The form of Zulfiqar, which is considered to be a space protector or a body protector by printing, is oval. Its edges are framed by a molding, and its surface is animated with simple notches. From the handle of Zulfiqar; "*yâ Fettâh, yâ Rezzâk, yâ Kebîr, yâ Halîm*" was written in the following verses with "*Lâ fatâ illâ Alî lâ sayfe illâ zülfiqār*". The handle of the talisman seal is fixed and rectangular in shape.

2.14 Tokat museum, inventory No: 75.46.1, 58x91x2 mm, Brass

See **Figure 14**.

Description: The hand-shaped, one-faced talisman seal symbolically corresponds to the hand of Hazrat Fatima or the Claw-i Âl-i Abâ. The anatomical structure of the hand, which is evaluated as a space protector or body protector by pressing, is not successful and the fingers are given apart. The surface of the seal, the edges of which are bordered by an erasure and, when pressed, the right hand comes out, is

Figure 13.
Talisman seal no. 2.13.

Figure 14.
Talisman seal no. 2.14.

divided by straight rows. On the talisman seal, the ground of which is adorned with small flowers, the sulus is written on the thumb with calligraphy, Surah Saff 13. His verse (in part): "*Nasrun minallâhi ve fethun karîb*" with 1122 H./ (1711 M.). Its history is engraved. On the index finger, the Word of Tawhid reads: "*Lailaheillallah Muhammad'un Rasullûllah*"; on the middle finger, Surah Saff 13. His verse (last part) is: "*ve beşşiril-mu'minin*", "*yâ Muhammad al-Evveli*"; on the ring finger: "*al-Āhiri, Az-Zahiril, al-Bātini, yâ Hāyy*"; on the pinky finger; "*yâ Kayyûm, yâ zel celâl-i vel ikrâm*" 'al-Asmâ' al-husnâs were written. The talisman is in the palm of the seal; "*Lâ fatâ illâ Alî lâ sayfa illâ Zu'l-Fikar*"; "*yâ Sultân, yâ Subhân, yâ Hannân, yâ Mennân, yâ Deyyân*"; "*yâ Rahmân, yâ Rahîm yâ Kerim, yâ Lâtîf, yâ Kuddûs*" in Surah al-Tawbah 129. The verse is (in part) "*Alayhi tavakkaltû ilahi*", "*yâ Settâr, yâ Vehhâb*" and Surah al-Tawbah 129. The verse (end) is written: "*ve huve rabbul-arshil azîm*". The handle of the talisman seal is not present.

2.15 Elazig archaeology and ethnography museum, inventory No: 76/F 18: 23, 45x66x2 mm, Brass

See **Figure 15**.

Description: The perimeter of the oval-shaped single-faced talisman seal is bordered by erasure and a hand motif is drawn on its surface. Symbolically, the anatomical structure of the hand, which is used in the sense of the hand of Hazrat Fatima or Claw-i Âli Abâ, is successful and the fingers are given together. The surface of the seal, which comes out as the right hand when pressed, is written on the thumb with nasta'liq calligraphy, in the 13.th verse of Surah Saff. His verse (in part): "*Nasrun minallâhi ve fethun karîb*"; on the index finger is the Word of Tawhid: "*Lailaheillallah Muhammad'un Resûlullah*"; on the middle finger, Surah Saff 13. verse (end): "*ve beşşiril-mu'minin*" followed by "*yâ Muhammad al-Evveli al-Ahiri*"; on the ring finger: "*Az-Zahiril, al-Batini, yâ Hayy, yâ Kayyûm*"; on his little finger, "*yâ Zel celâl-i vel ikrâm*" 'al-Asmâ' al-husnâs is written. On the palm of the talisman stamp, "*Lâ fetâ illâ Alî lâ sayfe illâ Zu'l-Fikar*"; "*yâ Sultân yâ Subhân, yâ Hannân, yâ Mennân, yâ Deyyân*" Asmâ-i-husnâs; Surah Hud 88. His verse (in part): "*yâ Rahmân, yâ Rahîm yâ Kerîm, yâ Latîf, Alayhi Tevekkeltu*" and Surah al-Hud 88. The verse (end) reads: "*ve ileyhi unîb*". The handle of the talisman seal is fixed and broken.

Figure 15.
Talisman seal no. 2.15.

3. Assessment

The 15 talisman seals examined are important works with their own unique and depth among the Ottoman seals. It turns out that the contents of the seals present a predominantly religious framework. In this context, according to the data obtained from the seal contents, which are meticulously read and evaluated; history and typology, interior design and text contents, verses and surahs, names of religious elders, 'al-Asmâ' al-husnâs, Seal of Suleyman motif, vefk and abjad, hand motif, zulfiqar, eye-shaped seal and fish figure are discussed and interpreted under the headings. In order to make the evaluation more understandable, each seal is called for being placed under the relevant heading according to its photograph numbers (no. 1,... etc.).

3.1 History and typology

Only specimen no. 14 of the talisman seals examined bears the date 1122 H./ (1711 M.). By comparing undated specimens with similarly dated specimens (calligraphy, decoration, etc.) [7, 24, 25], it can be stated that the seals generally belong to the Late Ottoman period. Unlike other seals, talisman seals prepared at the request of people usually do not contain the name of the owner. It has been revealed that no right signature has been found in the hakkâk that are known to be printed and used more as molds. Talisman seals were mostly handled as single-faced and fixed-handled. Figures, depictions on seals. It is seen that such layouts are limited to examples 2 and 3, and the contents are mostly provided in writing.

Typologically, the works have many different shapes and a rich collection of forms. According to their tables, 8 of them are circles, 2 are square, 1 is oval, 1 is sliced (flower) forms, 1 is hand motif, 1 is Zulfiqar and 1 is eye-shaped. It is clear that symbolic meanings are attributed to the selection and use of the types of talisman seals, which are considered in different forms. While the meanings attributed to forms, such as hands, swords and eyes (the eye of Horos), are known, it is thought that more commonly used geometric forms, such as circular and square, also contain symbolic meanings related to celestial elements. It can be said that there is no standard in terms of size in the dimensions of talisman seals and the size ranges vary.

3.2 Interior designs and text contents

When we look at the interior designs and text contents of the talisman seals, it is understood that the center is considered important. It is noteworthy that while verses, prayers or important names are written on the outer border or edges of the seals, cryptic formulas such as requests and expectations are mostly drawn to the centers of the talismans. In the aforementioned source, the *statement that 'if there is a single, double or three* 'al-Asmâ' al-husnâ *suitable for desire in the middle of the vefkin is* found' [23] is also an important data in terms of showing the emphasis of the middle area of the vefks in the seals. The most important contents that distinguish the seals from other talismans in the Ottoman seals are the presence of symbols and prayers unique to the Bektashis. It is seen that forms such as Âl-i Âba, the names of the Twelve Imams, the Nâd-ı Ali Prayer and the hand of Fatima, Zulfiqar, which are known to be unique to the Alevi-Bektashis, are used as symbolic forms in seals. The main reason for this is; It can be explained by the fact that the basis of sciences such as cifir and talisman is based on Hz. Ali. Talisman seals are much richer and more mysterious in content than objects, such as healing bowls, talisman shirts, etc. While the contents

of other objects made for positive (white) effects are more obvious, there are many, various and still unknowns about what the desire or expectation is in talisman seals, especially when they are created for a certain purpose. It is also likely to be created for content such as giving someone negativity or separating someone, or driving a wedge between someone, doing evil to someone. The fact that some letters are determined with special meanings and special characters in huruf-u mukataa is equipped to allow them to be done. In the talisman seals, which are printed and reproduced on paper and carried mostly hidden on people, the letters are usually written without dots; the verses are also mostly written without unmarked (not hareke). In the books of havas that letters without dots (fe, cim etc.) contain no [26], it is seen that written knowledge is applied in talismans. In this regard, it is clearly understood that the hakkâks who engraved the seals knew the intricacies of the work and that the examples were not the work of pilgrims, as claimed in some sources [2].

3.3 Surah names and verses

As a result of the text readings of the talisman seals examined, a total of 16. surah names and 20. verse numbers were revealed. The names of these surahs and the numbers of the verses in the Qur'an are as follows; Surah al-Baqarah 255. Ayat al-Kursi, Surah Isra 82. Verse, Surah Maryam 1. Verse, Surah Shura 1. and 2. his verses are from Surah Yasin 9. and 58. Verses, Surah al-Rahman 33. Verse, Surah Al-Anam 73. Verse (in part), Surah Saff 13. Verse (in part), Surah al-Hud 88. Verse, Surah al-Tawbah 129. Verse, Surah al-Naml 30. Verse, Surah Taha 111. Verse, Surah Yusuf 64. Verse, Surah Buruj 20.-21.-22. Verses, Surah Ali Imran 104. Verse and Surah Ihlas. In the examples; Seals 1, 5 and 12 contain *Surah al-Baqarah 255. His verse (Ayat-al Kursi)* is the most repeated. It is stated that if the protective and healing feature of the verse is read too much, the person who reads it will be protected from his enemy, his enemy will be destroyed, the doors of charity will be opened and he will be given blessings for the world and the hereafter. It is stated that the verse is healing when it is read seven (7) times and given to patients with water. *The verse*, which is brought down from under the feet of the throne, protects the people from the fear and terror of all kinds of people and jinns [20, 27].

On the talisman seals, on seals 3 and 10, *Surah Yasin 9. and 58. verses* are read. The mystery of Allah is hidden in Surah Yasin. The mystery of Yasin al-Sharif was also found in the 55., 56., 57. and 58. verses. It is hidden in its verses [27]. The Prophet said, "Yasin *is for what it is recited.*" As a sword that cuts through both sides, the surah should be recited for 3 or 7 days or 41 times by those who have a desire and desire. The one who recites this Surah says, *'If s/he is poor, s/he will become rich, if s/he is sick, s/he will be cured, if s/he is hungry, s/he will be satisfied, if s/he is thirsty, her/his thirst will end, if s/he is single, s/he will get married, if s/he is sorrowful, s/he will be relieved, "if he is afraids"/ he will be safe, if s/he is a traveler, s/he will be safe, if s/he is a prisoner, s/he will become halas, and the property of the one whose property has been stolen will return'*. It is believed that if the verse 58. of Surah Yasin is read a lot, the person who is sick or has any spiritual problem will be healed [20, 23]. In this direction, in examples; it can be said that Surah Yasin is one of the most preferred verses in order to achieve various purposes with the greatest protective and protective feature of Ayat al-Kursi. Surah Isra, which is mentioned in the seals, especially in examples 2 and 3, is 82. *It has been revealed that the phrase* 'healing' is mentioned, as can be understood *from the verse, 'We send down from the Qur'an things that will be healing and mercy for the believers'*. This shows that the seals were made for healing purposes.

In the seals 6 and 10 examined, the first Verse of Surah Maryam 'Kâf-hâ-yâ-ayn-sâd' and the first and second Verses of Surah Shura 'Hâ-mîm-ayn-sîn-kâf' are mentioned. These verses cannot be interpreted [2] exactly, but the letters contain the secrets arising from the angels between the sevenfold heaven and the sevenfold earth and the name of Allah. The letters have a value of 10, a total of 175 and the sevens are in accordance with the vefk, and there are astonishing secrets in this [27]. In these letter examples, it is seen that the verses of the two surahs are written together in a square vefk of 5x5 = 25, as they are written in plain writing. When asked what the beginning of the Surah *'Kâf-hâ-yâ-ayîn-sâd'* means, it is reported as follows: '*if I let you know what this means, you would be able to walk on water without getting your feet wet*' [28]. For His Holiness Abul Hasan al-Harrani, it is stated that these letters are an anti-poison against those who are poisoned, and that Hazrat Uthman listed the verses consisting of these letters and *prayed*, Allah, protect them from all kinds of accidents and troubles in honor of the titles of these verses." When these letters are written and thrown into the rough and stormy sea, the sea calms down and the land and sea are protective in all kinds of journeys; it is also reported by the righteous that it protects against all kinds of dangers against enemies, thieves and wild animals and gives blessings. Anyone who writes these cryptic letters on something or on it will have seen their very useful aspects. Hazrat Ali *said, 'What should I do to defeat the enemy*?', and it is stated that he taught a prayer beginning with these letters [27].

In the seals examined, the verses consisting of these letters (Mary 1. Verse and Shura 1 and 2. Verses) are used as to provides information why it is used from the above explanations. When we look at the contents of the other frequently written verses on the seals, it can be summarized as the existence and unity of Allah, the omnipotence, the help, success and power are with the help of Allah, the Qur'an, the names of prophets with miracles such as the Prophet Muhammad, Jacob, and the Prophet Moses, and the jinn and jinn communities.

3.4 Names of religious elders

When the contents of the talisman seals were read, it was revealed that the names of the religious elders (*such as the names of the Four Caliphs, the names of Âb-i Âli and the Twelve Imams*) and especially the names of the four great angels were repeated very often. It is noteworthy that the seals numbered 4 and 7 of the names are inscribed on the quadrangles of the square vefks or on the corners of the squares. Considering that the center, which has a special place in the seals, is the representation of God and the area where requests and expectations are written, the task of conveying the request quickly must have been pursued. The four great angels [2], who take the orders and commands of Allah and fulfill the orders about the earth, the sky and the people, are frequently included in the talismans as protectors, and more often as carriers of their wishes and wishes to Allah. In the examples, it has been determined that in addition to the names of religious elders, names with miracles are also highly preferred. For example, in seal no. 7, the names of Seven Sleepers and their dogs are read. The Seven Sleepers have always existed in Christian and Islamic cultures, having been recreated over the centuries. It is written in the form of the Seal of Süleyman motif. The Seven Sleepers, the representation of resurrection after death, *were seen and loved among the people as evidence of the belief that God would protect them and the existence of life after death*, especially in difficult times [29]. The frequent repetition of the names of the Seven Sleepers on the seals are talismanic words used, especially for the purpose of repeating the miracle that Allah has offered them in the

same way. In sample 10 of the seals, the name 'Khidr', which is mentioned with its properties such as being a talisman, healing and miracles, is read. It is also believed that Khidr heals the sick. He is also familiar with the science of chemistry and has knowledge about treasures. Khidr, who draws his power and all the things he can do from Allah, is one of the most solid religious motifs chosen as a tool for the fulfillment of wishes in seals [30, 31]. Khidr, in the seals since it is a strong name that is expected to be a miracle, it is probably difficult to realize, maybe we can say that it is specially chosen to relieve the distress of the owner.

3.5 'al-Asmâ' al-husnâs (the names of god)

As a result of the examination of the talisman seals, it was revealed that 'al-Asmâ' al-husnâs occupied an important place. In eight seals (2, 5, 8, 9, 11, 13, 14 and 15) of the samples, 'al-Asmâ' al-husnâ is repeated. The wisdom of the 'al-Asmâ' al-husnâ is expressed as the whole being, the whole universe, is subject to Allah and His Companions for the sake of any murad [32]. From the earliest times, it was believed that the Qur'an could also cure bodily diseases. It has been accepted that 'al-Asmâ' al-husnâ, which is the abjad equivalents of the Qur'an, can be used for this purpose as well, and it is hoped that some names may have special effects [33]. For the acceptance of prayers and requests, the remembrance and supplication to Allah should be with glorious names and honorable attributes [23]. In the seal no. 5, it is stated that the 'Ferd, Hayy, Kayyûm, Hakem, Adl, Kuddûs' 'al-Asmâ' al-husnâs are evaluated together; *it is seen that the Asmâs, also called the Sekîne Prayer, are often repeated in the magical disk boxes.* Talisman seals are usually inscribed on their centers; the *attributes of Allah in 'al-Asmâ' al-husnâ, such as 'Sâfî*, *Hafîz*, and *Fettâh'*, must be arranged in accordance with the meaning of the seal or the content of the expected request. Tawheed, especially in the verses on most seals; On the other hand, it is seen that there are important prayer phrases that appear in the boxes connecting the vefks, in the texts or at the beginning of the surah. The blessing of the Basmala was given by Allah to the prophets Noah, Solomon, Jesus and Muhammad. It is stated that Hazrat Isa *raised the dead under the name of "Bismillahiş Şâfi Bismillahil Kâfi"* and cured diseases that medicine could not cure [4]. When Hazrat Uthman asked the Prophet what Basmala al-Sharifa was, he replied, "*When Nimrodun threw Prophet Ibrahim into the fire, he turned the of truth into a cold fire that did not burn with the Basmala he suffered*". With the Basmala, which contains the beautiful names of Allah, the door of each key is opened. Prayers with these names will be answered by Allah [27].

3.6 Vefk (magical square) and abjad

In the talisman seals numbered 4, 5, 6 and 7 examined, 4 and 5 vefks consisting of numbers and letters are given more space than prayers. It is the symbolic expression of beliefs and wishes of the numerical values created by arranging the numbers in the talismans horizontally, vertically or diagonally [2]. It is explained that 3x3 = 9 vefkin is the fastest effective compared to other vefks. It is stated that if a person chooses the most suitable for him according to the temperament and elements to which he belongs, makes vefk and carries it on him, if he prays at the hour of the star to which he belongs, he will get what he wants [20]. In order for any desire to be realized, the vefk to be made must be the vefk of the star that will help the purpose and the murad to occur [34]. It has been understood that there are ancient ebced and ebced symbols in seal number 5, whose exact meaning and equivalent cannot be deciphered among

the talisman seals. Regarding the abjad, which provides a rich content for talismans, Hazrat Ali says; 'Learn the various abjad rules, numbers, and methods of use because many strange mysteries come to light with them.' [23].

3.7 Seal of Suleyman motif and seven seal symbols (magical signs)

The Seal of Suleyman Motif, which is used as the most common talisman sign in different religions and cultures, was found to be in the talisman seals numbered 9 and 11 from the samples examined. He is referred to as 'Hatem-i Süleyman' among Muslims and as 'Star of David' by Jews and Christians. The seal of the Prophet Solomon, which enabled him to rule over fire, water, wind, birds and animals, was a very powerful amulet in ancient times and was worn to protect against all kinds of dangers, misfortunes and evil. As a result of the examination, in the seals numbered 8 and 10, it turns out that there are seven seal symbols. The seven seal symbols, sometimes with each symbol in the form of square vekfs, or often with different versions, are the most powerful talisman symbols [2, 35, 36]. The seven symbols of Allah, which encompass the glorious name of Allah and are considered the seal of charity, are also inscribed on the door of the Kaaba [37]. This name is so powerful that it protects people from bad diseases, severe sorrow and suffering, as well as the health and healing they wish for [28]. It was thought that the power of the symbols was added to the power of the symbols by allocating letters to the seven seal symbols, and the seven letters representing each symbol had the same feature. According to the books of Havas, it is said that these letters are not mentioned in Surah al-Fatiha. In symbolism, seven is considered a symbol of completeness, integrity, unity, celestial harmony and evolution. Seven seal symbols, which vary as seals of good and evil [34], are also found in Hagia Sophia [28]. It is explained in detail in the aforementioned publication with its rituals that it was written and practiced in the form of *Ism-i Azam khatami*, especially for the healing of paralysis and similar diseases [38].

3.8 Hand motif

The hand motif on seals 14 and 15 has been a symbol of power and power throughout all ages and has been accepted as a representation of God [7]. The hand is one of the oldest symbols of strength and power ([39], especially protection from the evil eye. The hand motif has found widespread use in Islamic talismans as a shield from magic or magic [40, 41]. In Islam, the hand of Hazrat Fatima is referred to as '*The hand is not my hand, but the hand of our Mother Fadime*'. Hands are used for healing, magic, magic, the evil eye [42, 43] hands are widely used as a means of luck, blessing and influence [44]. In hand-related applications, the right hand is used for good and beautiful work. The left hand, on the other hand, has a negative meaning and is preferred in negative decisions [44]. The belief in the effect of the open hand is expressed in one of the most beloved amulets in the Islamic world [45]). In seals, which are a talisman, the separate form of the fingers of the hand is chosen to prevent evil. If the fingers of the hand are adjacent or closed, it is considered to be used to wish good luck to the person [44].

3.9 Zulfiqar

One of the examples, talisman seal no. 13, Zulfiqar, is commemorated in Ref. to Hazrat Ali [46]. Zulfiqar is known as a legendary sword bestowed on him by Allah

along with the duldul. In particular, the phrase '*Lâ fetâ illâ Alî lâ seyfe illâ Zulfikar*' is written on it, which means "*There is no brave but Ali, no sword but Zulfiqar*" [47]. The Janissaries, who believed that Hazrat Ali shattered the places he hit with Zulfiqar like a spider's web, regardless of iron or steel; before going to war, they placed amulets with the picture of Zulfiqar on their armpits. The Janissaries, who believed that the image of Zulfiqar would help them in the war, swore on these amulets when they promised in the context of their relations in the hearth [48]. In addition, in the texts, Zulfiqar is depicted as sharp enough to cut the stone, burning and destroying black magic with the fire it creates [49].

3.10 Eye-shaped seal

Among the talisman seals examined, it is seen that the seal no. 8 is in the form of an eye. The eye shape is a representation of the sun and moon as the right and left eye of the falcon god Horos. It is the most important of the Egyptian protectors and the one with the greatest powers. It is believed that the all-seeing eye can see all the evil that takes place in the world. The influence of the eye has spread from Egypt to Greece to Rome and other cultures along the Mediterranean coast. The eye shape, which is still popular as a talisman today, is claimed to provide one-to-one protection against theft, ignorance, poverty and disease [40].

3.11 Fish figure

It was seen that there was a pair of fish figures in the talisman seal no. 2 examined. The fish figure is one of the oldest symbols and was used in ancient times; it is a symbol of sexuality, fertility, life and continuity [50]. In non-Christian countries, in addition to sexuality, fish talismans represent prosperity in general, renewal of life, fertility and fertility versus infertility [40]. Fish is the representation of eternal life in Islam and Jesus in Christianity. Fish; fertility, life, continuity, happiness in marriage, the symbol of reproduction (sexuality) and the symbol of unity because they swim collectively [51]. On the talisman seals, there are stylized figures of a pair of fish, and on the border around it, there is usually a healing verse (*Surah Isra, 82. Verse*). It is known that this figure especially welcomes the zodiac signs and has protective properties. Considering the phrases written on them as a pair on the seals, it can be stated that this composition, which is frequently repeated in very different patterns, was probably produced to solve a reproductive infertility or a problem in marriage.

4. Conclusions

In the Ottoman Empire, talisman seals are concrete documents of the solutions that people produced to solve their problems within the framework of their culture. They are works that contain extremely valuable knowledge and culture. In some cultures, although materials are decisive in the production of positive (white) or negative (black) talismans, there is no such distinction in Islamic and Ottoman talisman stamps. Talisman seals should have given strength and strength to those who believe in them and use them against their spiritual problems or worldly desires, protect them from evil eyes and provide psychological support to the person. The works they produced by trying to benefit from their positive effects or to meet the expectations they wrote, drew or actually hid from others reveal the tradition of the period and the

economic power of the society. The material used, the quality of the workmanship and the contents of the texts written on it; It is a reflection of a rich union in terms of art, literature and sociology. These seals, in which a huge amount of knowledge and mystery are packed into small spaces, are the concrete works of abstract culture that stands out with its depth in terms of Ottoman metal art in Art History. With this study, 15 talisman seals in museums were unearthed and brought to the literature. It is understood that these seals, each of which is an example of a unique cultural heritage, were widely used in Ottoman society. With the preference of long-lasting metal materials in their constructions, the assets of the works have been preserved concretely until today. Each of the examples is as special as what they do not say and hide, as are the texts, figures and expressions they contain. It should also be stated that it is very difficult to explain the effects of talisman seals, whose usefulness may even be questioned today.

Conflict of interest

The author has no conflicts of interest to declare.

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This book discusses contemporary issues related to safeguarding and rescuing the UNESCO World's Natural and Cultural Heritage in 3D documentation and conservation engineering projects. These critical components in cultural heritage often require detailed management techniques and unique solution methods to address failures and remedial measures. Thirteen chapters present advanced techniques and innovative materials in conservation engineering and heritage science. The Safeguarding the World Culture Heritage community continues to find improved testing techniques for determining the engineering properties of heritage materials, including non-destructive testing methods. Also, the design and implementation studies for the cure and preventive conservation of built heritage should be improved. To minimize failure during conservation projects, contemporary issues and data may reveal valuable lessons and information to improve conservation project management and minimize economic losses. This book discusses these aspects using appropriate methods in a simple way. This book discusses many interesting topics in conservation engineering and heritage science like advances in the documentation and characterization of built heritage materials, modern geotechnical and structural assessment methods and tools, geotechnical earthquake engineering, principles and practice in foundation design, slope stability analysis, and modeling in geomechanics, offshore geotechnical engineering, and geotechnical engineering for the preservation of historical buildings and archaeological sites.

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