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IMPACTS OF CLIMATE CHANGE ON VERNACULAR LANDSCAPES AND CULTURAL HERITAGE

Gül Aktürk

Impacts of Climate Change on Vernacular Landscapes and Cultural Heritage

This book reveals the impacts of climate change and anthropogenic interventions on vernacular landscapes as a cultural heritage through an analysis of regional and urban development projects and local-level practices. Vernacular landscapes encompass customs, practices, places, objects, artistic expressions, and values that are innate to a particular place and time, with climate knowledge embedded alongside other environmental, cultural, and societal determinants. The cultural heritage of these places is threatened by climate and disaster risks, such as loss of land, food sources, water resources, intangible values, and displacement.

This book first critically unfolds the legacy of vernacular heritage responses to local conditions, focusing on climate, drawing on the examples of vernacular heritage sites worldwide, including India, Japan, and Mali. It then critically analyzes the effects of climate and disaster risks on vernacular heritage, accelerated by spatial and local decisions and practices in a detailed study in Fındıklı, a district of Rize Province on the Black Sea coast in Türkiye. It evaluates the insights, perceptions, and experiences of local people through interviews aiming to shed light on climate-resilient vernacular heritage sites.

By understanding the present challenges resulting from past decisions and actions at various scales, this book offers an interdisciplinary approach to the emerging field of climate change adaptation of cultural heritage studies. Bridging multiple fields, it will be of interest to researchers, academics, and students interested in cultural heritage, climate change studies, environmental studies, architectural and landscape conservation, and planning.

Gül Aktürk is Assistant Professor in Heritage Studies in the Faculty of Archaeology at Leiden University. Her research interest lies in the intersection of climate change and cultural heritage. Her research also investigates climate resilience of cultural heritage, vernacular heritage, cultural landscapes, climate displacement, intangible cultural heritage, land-use changes, critical heritage studies, and archaeological heritage management.

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She completed her PhD with the title of "Climate Change and the Resilience of Collective Memories" in the Faculty of Architecture at TU Delft in January 2023. She received VAG Publication Grant to publish her PhD thesis as a book. Before completing her PhD, she started her postdoctoral research on I-tree 2.0 NL project in the Industrial Design Engineering Faculty at TU Delft.

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To my son, Leon Aktürk Hauser
and to my husband, Stephan Hauser
Leon, your arrival brought light into a time of deep uncertainty, teaching me what it means to hope, to persevere, and to love without bounds. You are the beating heart of this book, and the reason I kept going.
To my husband—your quiet strength, unwavering belief in me, and endless patience carried this project through its most difficult moments. This book would not exist without you.
With all my love—this is for both of you.

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Foreword

In an era marked by rapid environmental change, the landscapes that have shaped human culture and heritage are facing unprecedented challenges. Vernacular landscapes, developed through centuries of human interaction with nature, represent not only architectural traditions but also the enduring relationship between communities and their environments. The wisdom embedded in these landscapes, from the materials used to the spatial arrangements and construction techniques, reflects a deep understanding of local climates, topographies, and ecosystems. Yet, as the world faces the far-reaching impacts of climate change, these landscapes are increasingly threatened, making their preservation and adaptation a matter of urgent concern.

This book, *Impacts of Climate Change on Vernacular Landscapes and Cultural Heritage*, offers a timely exploration of the complex and evolving nature of vernacular architecture and landscapes. Focusing on regions like Fındıklı in Turkey, and drawing from comparative case studies across the globe, it delves into the intricate relationship between climate and vernacular landscapes as cultural heritage. The research presented here provides valuable insights into the ways that local communities have historically adapted to their environments, using innovative, climate-responsive strategies that offer both practical and symbolic value.

In examining how vernacular landscapes have been shaped by climatic factors and human ingenuity, this book brings attention to the vulnerabilities these landscapes now face due to modern environmental stresses. It not only highlights the challenges posed by climate change but also presents opportunities to learn from the past and apply those lessons to contemporary preservation and sustainability practices. The case studies explored within provide a rich tapestry of knowledge, demonstrating how adaptive practices from diverse geographical contexts can inform the ongoing efforts to protect our shared cultural and environmental heritage.

This work is an invitation to reflect on the critical importance of vernacular landscapes in preserving both our cultural identity and the sustainable practices that have long supported human habitation. By re-examining how these landscapes have weathered the challenges of their time and, importantly,

how they might respond to the climate crises of today, this book offers a roadmap for the future.

As climate change continues to reshape our world, it is crucial that we learn from the past, value the knowledge embedded in our landscapes, and continue to safeguard these invaluable cultural treasures. This book serves as a crucial step toward understanding how vernacular heritage can be preserved and adapted in the face of a changing climate, ensuring that these landscapes continue to inspire and sustain future generations.

Acknowledgments

This book is the result of four years of research conducted as part of my doctoral studies titled "Climate Change and the Resilience of Collective Memories: The Case Study of Fındıklı in Rize, Türkiye," undertaken at the Faculty of Architecture, TU Delft, between 2018 and 2022. Its publication would not have been possible without the generous financial support of the Vernacular Architecture Group Research Grant (Ref PG23/01), the early encouragement of Routledge editor Grace Harrison, and the English language revisions kindly provided by Kati Mcardle.

Although I had intended to revisit the case study for further updates, the process of completing this book coincided with a particularly challenging period in my life. A difficult pregnancy that led to seven months of hospitalization, the start of a new role as an assistant professor, and the loss of a loved one created unforeseen obstacles. While I often wished that the opportunity to publish this book had come at a less difficult time, I am grateful that it is now complete.

I would like to extend my heartfelt thanks to the Netherlands Institute in Turkey (NIT) for offering me the opportunity to present my work following its publication. I am also deeply grateful to Prof. David Charles Harvey for his thoughtful feedback and kind encouragement throughout. Special thanks go to my PhD supervisor, Dr. Herman van Bergeijk, and my promoter, Prof. Carola Hein, for their invaluable guidance and critical insights.

I am especially indebted to M. Reşat Sümerkan and Hamiyet Özen, whose early advice helped shape the selection of my case study area, and to the villagers of Fındıklı, whose cooperation and hospitality made this research possible.

My sincere appreciation goes to Sandra Fatoric, Hannah Fluck, Meredith Wiggins, and Hana Morel, whose external feedback and unwavering support sustained me through some of the most difficult moments. I am also thankful to my colleagues and friends at TU Delft—Burcu Köken, Gökçe Önal, Dirim Dinçer, Penglin Zhu, Esma Höller, Lukas Höller, Sine Celik, Giulia Granato—and to many others whose names I may not have listed here, for their camaraderie, encouragement, and coffee break conversations. Gökçe's

memory lives on every page of this book—her friendship, warmth, and support were a source of light during our time together, and I carry her with me always.

Above all, I am profoundly grateful to my family. To my parents—especially my mother—who reminded me to persevere when I doubted myself. To my brothers, whose steady support accompanied me throughout this long journey. And to my husband, whose academic insight and unwavering personal support helped carry this project to completion. With him, we have grown into a family of three.

I dedicate this book to my son, Leon Aktürk Hauser, whose arrival into this world was as miraculous as it was challenging. He is a true symbol of resilience and hope. I also hold in memory my father-in-law, Jean Jacques Hauser—I believe he would have been proud.

Abbreviations

AFAD	Afet ve Acil Durum Yönetimi Başkanlığı [Ministry of Interior Disaster and Emergency Management Presidency]
ALIPH	International Alliance for the Protection of Heritage
CCA	Climate Change Adaptation
DOKAP	Doğu Karadeniz Projesi Bölge Kalkınma İdaresi Başkanlığı [Eastern Black Sea Project Regional Development Administration]
DRM	Disaster Risk Management
DRR	Disaster Risk Reduction
DSI	Devlet Sular İdaresi [General Directorate of Hydraulics Works]
EU	European Union
GIS	Geographic Information System
HGM	Harita Genel Mudurlugu [General Directorate of Mapping]
ICOMOS	International Council on Monuments and Sites
IKS	Indigenous Knowledge Systems
IPCC	Intergovernmental Panel on Climate Change
IRAP	İl Afet Risk Azaltma Planı [Provincial Disaster Risk Reduction Plan]
JNAPs	Joint National Action Plans
KUDEB	Koruma Uygulama ve Denetim Büroları [Conservation Implementation and Supervision Bureau]
NGO	Non-governmental organizations
NPS	Natural Park Service RCC Koruma Bölge Kurulu [Regional Conservation Council]
SIDS	Small Island Developing States
TEK	Traditional Ecological Knowledge
TKGM	Tapu ve Kadastro Genel Müdürlüğü [General Directorate of Land Registry and Cadastre]
UCLG	United Cities and Local Governments
UNDP	United Nations Development Programme

UNESCO	United Nations Educational, Scientific, and Cultural Organization
UNFCCC	United Nations Framework Convention on Climate Change
WMF	World Monuments Fund
WMO	World Meteorological Organization

1 Introduction

Impacts of Climate Change on Vernacular Landscapes and Cultural Heritage

Vernacular architecture is characterized by the use of local materials, construction techniques, and design elements in response to the needs of individuals and communities, shaped by local climate, topography, geography, economy, and culture (Asquith & Vellinga, 2006). Typically constructed by local artisans or laypeople without formal architectural training, it draws upon knowledge passed down through generations—an accumulation of wisdom and experience specific to place and environment. As such, vernacular architecture is deeply embedded in the local context, evolving over time to reflect changing environments, lifestyles, and cultural values.

The concept of "landscape" is defined as "an area, as perceived by people, whose character is the result of the action and interaction of natural and/or human factors" (Europe, 2000).[1] Cultural landscapes, therefore, emerge through complex social-ecological processes and are constantly modified, cultivated, and reshaped by human activity (Aktürk & Dastgerdi, 2021).

In contrast to "political landscapes," as defined by J.B. Jackson, vernacular landscapes emerge organically through informal planning and practical adaptation to local conditions and customs over time (Jackson, 1984). These landscapes are not limited to rural areas; they also include regional and informal spaces that serve as expressions and carriers of vernacular culture.

Vernacular landscapes—recognized by the United States National Park Service as one of the four categories of cultural landscapes—represent the everyday lives and practices of the people who shaped them (The Cultural Landscape Foundation, 2025). These landscapes are expressions of physical, biological, and cultural character as molded by individuals, families, or communities through land use, building practices, and cultural attitudes. They reveal how people inhabit, shape, and adapt to their environment over time.

Vernacular landscapes hold a unique place in the preservation of cultural heritage, acting as a vital link between culture and nature. Cultural heritage is a legacy from previous generations. It embodies unique representations, both tangible and intangible, of our identity from the past and connects us to our present and future. These landscapes reflect this duality, encompassing architecture, land-use practices, biodiversity, and cultural identity. Despite

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their significance, vernacular landscapes are seldom recognized as heritage sites, even though they represent an integrated expression of both cultural and natural heritage. This book positions vernacular landscapes as inclusive of settlements, buildings, structures, and land-use systems rooted in traditional knowledge and practices.

Since the onset of industrialization, the conditions under which vernacular landscapes emerged have undergone profound changes. Rapid urbanization, technological advancements, shifts in lifestyle, and environmental challenges—chiefly climate change—have all exerted increasing pressure on these landscapes. Climate change, arguably the most pressing global issue of the 21st century, has introduced new risks to health, economies, livelihoods, infrastructure, and human settlements. Rising temperatures, extreme heat, drought, flooding, and landslides are among the phenomena affecting heritage sites globally. However, the specific ways in which vernacular landscapes are impacted remain under-researched and underappreciated.

Often perceived as outdated relics of pre-industrial societies, vernacular landscapes are now being reconsidered. In many developing regions, they remain inhabited and functional, offering valuable insights into climate-adaptive design and resilience. Architects, planners, and heritage professionals are beginning to draw lessons from these landscapes, yet efforts to systematize and translate such localized knowledge into broader scientific or policy frameworks remain limited. This is gradually changing, as organizations like the Intergovernmental Panel on Climate Change (IPCC), the United Nations body for assessing the science related to climate change, begin to recognize the roles of Traditional Ecological Knowledge (TEK) and Indigenous Knowledge Systems (IKS) in climate adaptation.

A further challenge lies in the scale of analysis. While climate change impacts are usually assessed on regional, national, or global levels, vernacular landscapes are inherently local. Each one presents unique challenges, shaped by geographic, cultural, and environmental factors (e.g., desertification, monsoon shifts, modernization pressures). Some shared vulnerabilities—such as those introduced by industrialization—exist but feasible solutions require locally grounded strategies for effective assessment and intervention.

1.1 Background: Climate Change and Vernacular Landscapes in the Eastern Black Sea Region of Türkiye

Vernacular landscapes in the Eastern Black Sea region of Türkiye face increasing threats from climate change, yet they remain underrepresented in both academic literature and policy frameworks. Many scholars, like Yurt and Kulaksızoğlu, have addressed disaster risks in the region—conceptualized the risks as natural disasters—through disaster risk maps in the Eastern Black Sea region (Kulaksizoglu, 1991; Yurt, 2012). However, these studies largely neglect the implications of climate change on rural areas where vernacular heritage is most prominent. Despite the interconnected nature of climate and

disaster risks, an integrated approach to understanding these interactions has been largely absent in urban resilience strategies (United Nations Office for Disaster Risk Reduction, 2020).

Although the Eastern Black Sea region is known to be hazard-prone, it has only recently begun to be examined through the lens of integrated climate and disaster risk (Ücuncu & Demirel, 2019). Even then, the focus has remained on precipitation trends and rainfall statistics, with little attention given to the sectoral implications of these hazards. Governmental reports, such as those published by the Ministry of Environment, Urban Planning, and Climate Change (T.R. Ministry of Environment and Urbanization, 2021), offer some insights into these effects across sectors—but notably exclude cultural heritage.

Much of the work by public authorities at the national level concerns future climate impacts across different sectors and regions except the cultural heritage sector (Gençer, 2018). The absence of cultural heritage stakeholders from the national climate adaptation and planning landscape (Şahin, 2014) reflects this gap. Despite the evidence of loss and damage to cultural heritage sites in the Eastern Black Sea region, cultural heritage is not a necessary component of the national agenda to deal with climate change risks. Yet, local communities have occupied these sites for generations. Without the identification and documentation of these vulnerable sites, the sense of history, place, and identity held in these sites will be irreversibly lost. Building resilience of vernacular heritage to climate and disaster risks in the Eastern Black Sea region in the Republic of Türkiye (formerly the Republic of Turkey) requires the implementation of conceptual integration of climate change adaptation and disaster risk management. Based on the long-term history of vernacular-built heritage and flooding and landslides in the rural areas of Fındıklı of Rize in Türkiye, the decisions and practices at various levels highlight the complementary act of the destruction of vernacular heritage in times of climate change. Studies such as this can inform public authorities about the urgency of the matter and emphasize the significance of political will to prompt action on and investment in climate adaptation and disaster risk management of cultural heritage sites.

Governments work to mitigate the effects of climate change, although developing countries are slow to address these issues. The Republic of Türkiye has implemented the initial steps to meet its climate adaptation targets. As climate change multiplies the risks of hazards, the political discourse in Türkiye shifts toward accepting these hazards as the effects of climate change rather than as natural hazards. The Minister of the Environment, Urban Planning, and Climate Change,[2] Murat Kurum announced the Regional Climate Action Plan on July 12, 2019 for seven regions starting from the Black Sea region, which is further discussed in Chapter 7 (Türkiye Cumhuriyeti Çevre ve Şehircilik Bakanlığı, 2019). While these 15 actions promoted the public's interest in these environmental challenges, the awareness of traditional practices of the past has been only referred to in one action mentioning

the importance of using local construction materials. This decisive shift in political discourse paved the way for investments in international agreements on climate action. The ratification of the Paris Agreement by Türkiye's parliament at the time of writing the thesis (Gül Aktürk, 2023)[3] in 2021 is an example of this. It also marked the start of an increasing acceptance of climate change in political and academic discussions. And yet, the national government has not set the preservation of cultural and natural heritage resources as a priority in climate adaptation and action plans.

In the international arena, UNESCO and its advisory bodies of IUCN, ICOMOS, and ICCROM elaborated on the necessity of integrating cultural heritage management in climate change adaptation and disaster risk reduction with their initiatives in the last decade (The World Heritage Centre of UNESCO et al., 2010). These and other global actors and institutions have made advancements in climate adaptation and disaster risk management of cultural heritage sites with the launching of initiatives such as the Climate Heritage Network in October 2019. In collaboration with the Network, several other public and private actors, as well as NGOs, joined the initiative to add climate change adaptation of heritage assets into their agendas. The World Monuments Fund (WMF), a private nonprofit organization founded in 1995, has taken a similar approach in its programs, such as the World Monument Watch, which included climate change-related vulnerabilities in its criteria to protect the sites under threat. Recently, the virtual International Co-sponsored Meeting on Culture, Heritage and Climate Change[4] discussed strengthening the role of culture and heritage in climate change adaptation through expert meetings. Similarly, the Climate Heritage Network aimed to incorporate heritage in IPCC reports, which are scientifically and methodologically rigorous. Despite the loss and damage of vernacular assets as integral parts of landscapes, vernacular heritage sites are not the key focus of heritage institutions in climate change adaptation actions and strategies. While heritage studies were found to be less methodologically sound and place-based by the IPCC scientific community, there is a strong motivation for the establishment of linkages between the two.

The governance of climate change nationally requires a holistic approach, which includes the collaboration of all sectors, especially cultural heritage agencies. Local management of cultural heritage can be undermined by public stakeholders when addressing climate change adaptation on a larger, non-localized scale. For instance, in 2021 the municipality of Izmir, with the help of United Cities and Local Governments (UCLG), announced the "İzmir Declaration" in an event to emphasize the important role of local stakeholders' participation in culture and cultural heritage for sustainable development (Culture 21 UCLG Committee et al., 2021). Initiatives such as this can help to mainstream the protection of cultural heritage against the impacts of climate change at the local level for sustainable development of cities by providing the bridging role of global city actors. One example of

this includes funded projects such as developing a novel "Climate change Risk Assessment Framework for cultural heritage in Turkey (CRAFT)," led by Durham University in collaboration with the Middle Eastern Technical University (UK Research and Innovation, n.d.). Through these initiatives and collaborative efforts with universities, progress in recognizing the necessity and urgency of climate adaptation and disaster risk management of cultural and natural heritage sites is possible. Managing the integrated risks of climate and disasters in vernacular heritage sites by local communities with the help of public and private authorities can enhance building resilience.

This research, therefore, calls for attention from the national governing bodies of the Ministry of Urban Planning, Environment, and Climate Change, the Ministry of Interior Disaster and Emergency Management Presidency (AFAD), the General Directorate of Water Works (DSI), the Ministry of Culture and Tourism, and local communities and local decision-makers referred to throughout the dissertation. Regarding the role of water in disasters, water institutions play a significant role in flood management, mainly through top-level authorities including the central government, and its representatives in the regions and cities (Yüksek et al., 2013). The Turkish State Hydraulics Works (DSI) is authorized to construct protective structures against floods, while the Ministry of Interior Disaster and Emergency Management Presidency (AFAD) plans for disaster prevention and manages natural disasters including floods and landslides. The climate and disaster risk management of cultural heritage has become more challenging due to the localized effects of these hazards.

1.2 Aim of this Book

This book aims to explore how climate change and disaster risks are affecting vernacular landscapes and to evaluate their vulnerabilities through the lens of spatial planning and local practices. It investigates how climate change, through rising temperatures, shifting precipitation patterns, and extreme weather events, affects the physical and cultural fabric of these landscapes. Drawing from case studies, it argues that traditional knowledge embedded in vernacular architecture and landscape practices can provide adaptive strategies for resilience and sustainability. Vernacular landscapes, shaped by such knowledge systems, offer valuable insights into sustainable land use, water management, and building design practices that are often overlooked in contemporary development paradigms.

The book aims to bridge the gap between climate change discourse, heritage conservation, and landscape studies, providing an integrated framework for assessing climate vulnerability and resilience in vernacular landscapes. It also seeks to shift the narrative around these landscapes—from being seen as fragile or obsolete to being recognized as dynamic systems capable of adaptation and transformation in response to change.

1.3 Research Questions

The core question driving this research is:

How have spatial planning decisions and local practices influenced the management of vernacular landscapes in the face of climate change and disaster risks? What lessons can be drawn from these experiences to inform future strategies for resilience?

To address this, the book analyzes vernacular heritage at three scales: building, district (landscape), and city. Using both historical and narrative approaches, it identifies how planning decisions and local practices have shaped vulnerability and resilience over time. These insights are used to propose context-sensitive strategies for disaster risk reduction and climate adaptation.

The findings aim to inform not only academic discourse but also policy and decision-making—particularly in regions where heritage and climate action have traditionally been treated as separate domains. The case of Fındıklı offers a model for integrating traditional knowledge into contemporary climate policy.

1.4 Methods and Approaches

This work adopts an interdisciplinary approach that intersects museum and heritage studies, environmental and conservation science, architecture, planning, anthropology, sociology, geography, and development studies. It focuses on capturing the lived narratives of local communities while conducting spatial analysis of vernacular landscapes, generating transferable strategies for climate adaptation and disaster risk management.

Key challenges addressed include the degradation of vernacular landscapes and the accelerating impacts of climate change. Through cross-disciplinary concepts, the study seeks to bridge the theoretical gap between climate change and the preservation of vernacular heritage—recognizing that climate change is occurring at an unprecedented pace and remains contested in some circles.

A mixed-methods framework supports the primary case study in Türkiye, promoting cross-sector collaboration. The research draws upon qualitative data from unstructured interviews and field observations, supported by quantitative spatial analysis using ArcGIS. Field visits to Fındıklı took place in two seasons (winter and summer) in 2019. Interviews and observations were coded and analyzed using ATLAS.ti. This triangulated approach offers context-specific evidence for enhancing the resilience of vernacular heritage.

1.4.1 Case Selection

Fındıklı in the Rize Province of Türkiye was chosen as the primary case study to investigate the impact of climate-related disasters, particularly floods and

Figure 1.1 The district of Fındıklı in Rize with borders of the district and city shown on the map. Map created by the author and colleague Stephan Jacques Hauser using ArcGIS (Aktürk & Hauser, 2021).

landslides, on vernacular heritage (Figure 1.1). Two main factors motivated this selection:

1 Environmental Vulnerability: Rize Province experiences recurrent, intense floods, and landslides (Karsli et al., 2009).
2 Cultural Richness: Fındıklı is home to a diverse array of vernacular and natural heritage assets, representing both historical adaptation to climate and current vulnerability.

The case illustrates vernacular architecture as both a product of local environmental knowledge and a heritage at risk. Villages near major rivers are especially vulnerable to extreme rainfall events.

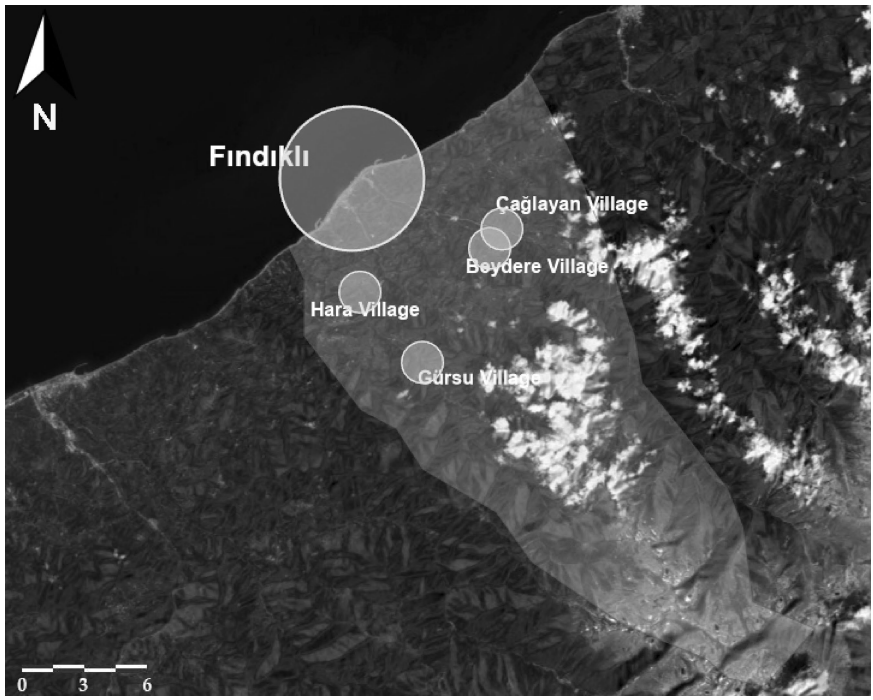

Figure 1.2 The Fındıklı locations where the interviews were conducted are shown on the map. Map created by the author and colleague Stephan Jacques Hauser using ArcGIS (Aktürk & Fluck, 2022).

The Fındıklı case is based on original fieldwork conducted in 2018 as part of doctoral research. The case study areas include the four villages (Çağlayan, Hara, Gürsu, and Beydere) and the center of the district of Fındıklı. The first key reason behind the selection of the villages of Çağlayan, Hara, and Gürsu is that the majority of the vernacular heritage sites are located in these areas (Figure 1.2). Compared to the other villages, Beydere Village and the district center are greatly affected by disasters in general, including flooding and landslides in particular, as mentioned throughout the book. Another key reason is that the snowballing method of identifying interviewees and their availability at the time of the interviews in 2019 led to a concentration on these sites. This fieldwork resulted in descriptions of vernacular heritage practices and provides a comparison of the impacts of disaster events on vernacular landscapes.

Fındıklı is pictured as an architecturally and aesthetically pleasing vernacular landscape in books published by governmental and provincial bodies and NGOs such as DOKAP (Rize Il Kultur Turizm, 2014). However, the climate crisis is changing this picturesque perception.

Comparative references are drawn from literature, including Leh-Ladakh,[5] divided between India and Pakistan (Figure 1.3), Miyama Village in Japan (Figure 1.4), and Dogon Villages in Mali (Figure 1.5). These are not direct

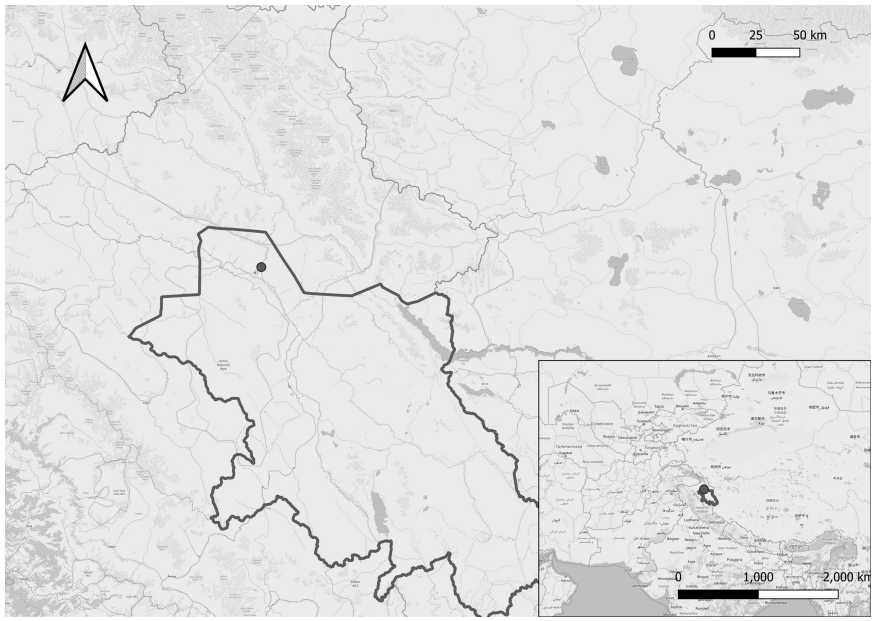

Figure 1.3 The location of Leh-Ladakh, India. Map created by the author using QGIS.

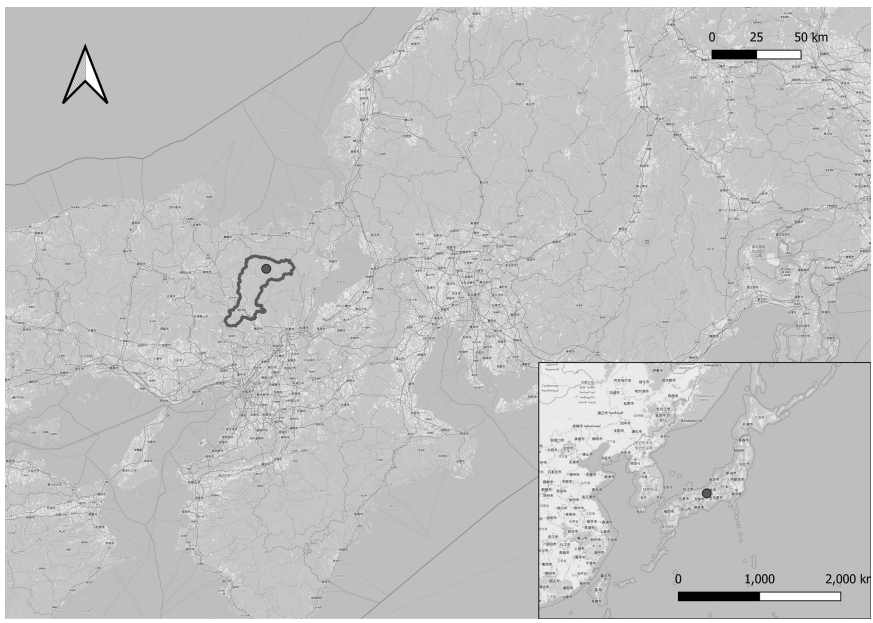

Figure 1.4 The location of Miyama village, Kyoto in Japan. Map created by the author using QGIS.

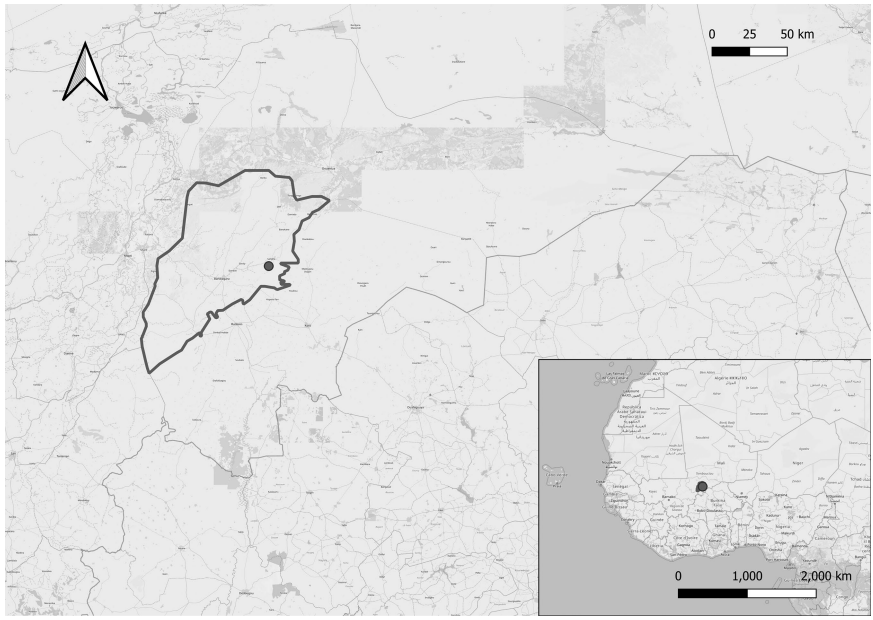

Figure 1.5 The location of Dogon village, Mali in West Africa. Map created by the author using QGIS.

comparisons but serve to highlight global challenges and transferable lessons in managing vernacular landscapes.

Case selection was guided by several criteria:

- Relevance to current climate and heritage debates
- Clear tensions between planning and local practices
- Visible threats to vernacular landscapes
- Potential to inform methodologies and frameworks
- A focus beyond Eurocentric paradigms, highlighting the Global South

1.4.2 Mapping

To uncover long-term spatial and environmental transformations in Fındıklı, this study employed aerial imagery, historical maps, and GIS-based analysis. ArcGIS software, along with archival sources, historical records, images, and maps, reveals disappearing heritage sites (Hauser, 2020) and sites under threat. Historical maps contribute significantly to the identification and monitoring of changes in land use (Nicu & Stoleriu, 2019) and natural changes, such as floods and land erosion (Nicu, 2017). The data gathered from historical maps offer reliable sources for disaster risk assessment of cultural heritage (Nicu, 2016) and management of these sites (Nicu & Stoleriu, 2019). Traces of past traditional landscapes can be determined through analysis of historic

Table 1.1 Details of mapping data used in Chapter 4 (Aktürk & Hauser, 2021)

Data	*Year*	*Source*
Aerial photo	1969	HGM Harita
Flooding	2019	DSI
Landslides	2019	DSI
Disaster prone	2019	AFAD
Natural heritage	2019	https://karadeniz.gov.tr/harita/
Built heritage	2019	https://karadeniz.gov.tr/harita/
Imagery base map	2019	ArcGIS World Imagery

maps, images, aerial photographs, cadastral, and military maps in ArcGIS although it is difficult to quantify and rectify the traces of past landscapes even with multiple control points (Liu et al., 2018). However, data regarding floods, landslides, and the locations of heritage sites in rural areas are usually inconsistent and vary depending on the inventories of different institutions.

ArcGIS software was used to trace landscape transformations and to identify heritage sites at risk due to natural hazards such as flooding and landslides. Historical aerial photographs from different years (1956, 1959, 1969, 1970, 1973, 1975, 1982, 1989, and 2002) were collected from the Rize Provincial Directorate of Environment and Urbanization and the General Directorate of Mapping (HGM Harita) (General Directorate of Mapping, n.d.). While the earliest available aerial image dates to 1956, its low resolution and scale (1:60,000) limited its usability. Furthermore, many of these photos focus on the coastal area leaving the hinterland in the dark. In a similar study, these maps were slightly offset from the base map (Alisan-Yetkin, 2018).

The photograph from 1969 was selected due to its coverage of inland areas, where most vernacular heritage is concentrated (Table 1.1). It was analyzed alongside the 2019 satellite image to compare land use changes, deforestation, urban sprawl, and river modification. Geo-rectification of the 1969 image was achieved through the identification of stable control points, allowing for its integration with the 2019 image. Despite limitations in quality and contrast, visible features, such as white patches in forests (interpreted as recent deforestation), were analyzed using polygon and line features in ArcGIS to reconstruct environmental degradation.

To create a comprehensive disaster risk map, shapefiles for flooded zones and landslide-prone areas were sourced from the General Directorate of Hydraulic Works (DSİ) and the Disaster and Emergency Management Presidency (AFAD). Due to inconsistencies between institutional data, the study cross-referenced and combined overlapping datasets to improve accuracy. Heritage sites were geolocated based on coordinates obtained from DOKAP's *Karadeniz Kültür Envanteri* (DOKAP, n.d.) and the Rize Provincial Ministry of Culture and Tourism. The primary data derives from the DOKAP project, which was not only a more recent documentation of the historic sites, but

also included various cultural and natural heritage sites, whereas the data from the Ministry only included the historic mansions (Rize İl Kültür Ve Turizm Müdürlüğü, 2014). As the data relies primarily on the database of DOKAP, it may not reflect the complete view of existing vernacular heritage in the district. There are more than 150 vernacular houses scattered into sometimes inaccessible lands in the hinterland. The geographical locations of the sites were entered into a Microsoft Excel table in the format of longitude and latitude. These coordinates were in degrees, decimal minutes, and seconds from Google Maps, and these were converted into degrees. The Excel file was then imported into ArcGIS to identify the exact location of heritage sites on the maps. The vernacular heritage was built as long as 300 years ago, in some cases, and thus it appears on both historic and current images.

The aerial photograph of 1969 has been rotated, georectified, and adjusted to overlap with the 2019 aerial and satellite image according to points that have not changed over the last 50 years. In particular, buildings appearing in both the 1969 and 2019 imagery were flagged as long-standing vernacular structures, with further heritage attributes confirmed through interviews and field observations. Although many orthophotos were available from 1980 onwards, the monochrome quality and limited inland coverage led to prioritizing the 1969 image as the historic reference point.

The border of the case area, within the district of Fındıklı, is determined according to the rotated aerial image of 1969 (Figure 1.6). Thus, the Sümer River was not included on the map as it does not include cultural heritage sites according to the inventory of the Black Sea DOKAP project. The data outside of these borders was not involved in the analysis of the disaster risk map. To avoid inconsistencies, each data set was analyzed within the borders of the oldest picture. Specific characteristics were analyzed from the map of

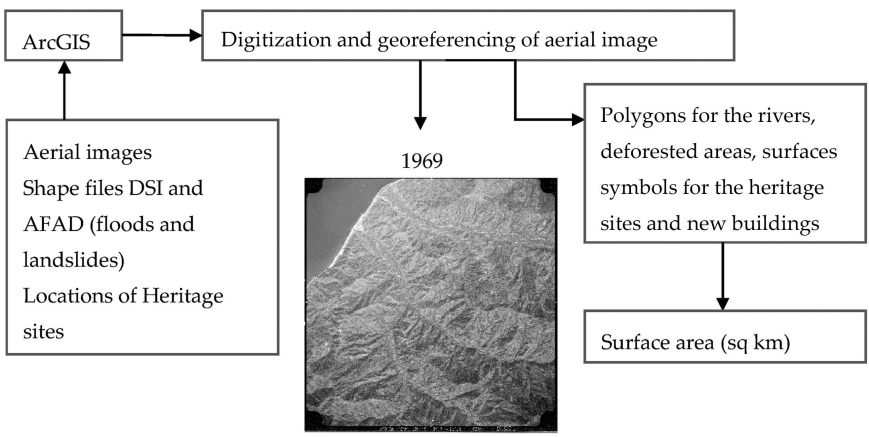

Figure 1.6 A flow diagram illustrating the analysis steps to identify vulnerable sites in Fındıklı. Flow diagram created by the author and colleague Stephan Jacques Hauser (Aktürk & Hauser, 2021).

1969 such as the shape of the river, coastline, buildings, and deforested areas at the time.

Once the old map was geo-rectified adequately by placing control points referenced by the 2019 map in ArcGIS, polygon features were used to illustrate the elements analyzed for this study. Using this approach, a line feature was created for the coastline, polygons were used for rivers and deforested areas, and buildings were identified using symbols. While deforested areas are visible on the current map, the white patches in forested areas on the 1969 map were accepted as deforested sites, as the black and white orthophoto made those features difficult to identify. The white patches are also understood as deforestation in recent years where nature has not had time to re-take over. A GIS database was used to collect location information of cultural properties and historically analyze the depletion of forests, modifications to rivers, and urban sprawl as accelerating factors of flooding and landslides, all of which affect the vernacular built heritage. This method can be used as a base to generate risk assessment maps of cultural and natural heritage sites and illustrate the threat to vernacular heritage sites in the area and beyond the protected areas. Alongside the geospatial analysis, the on-the-ground and local experiences are also highly valued in understanding of the local people's approach in tackling disaster events.

1.4.2.1 Interviews and Ethnographic Insights

A central component of this research is the ethnographic inquiry into local experiences and community responses to climate change. Qualitative data collection consisted of face-to-face, unstructured interviews conducted across five key locations: Fındıklı town center, and the villages of Beydere, Çağlayan, Hara, and Gürsu. These sites were selected based on their vulnerability to climate-induced disasters and the presence of vernacular heritage.

Fieldwork was conducted in two phases, a week-long visit in January and two-week-long visits in July 2019, to capture seasonal variation and local rhythms. The researcher conducted interviews and participant observations during walks through the villages, often accompanied by interviewees. This informal approach facilitated natural dialogue, allowing respondents to share insights in a familiar context (Swain & King, 2022).

In total, 14 formal interviews were conducted with participants ranging in age from 40 to 84 years old. Subjects included homeowners, farmers, artisans (notably stonemasons), and construction workers (Table 1.2). Gender representation included five women and nine men. Snowball sampling enabled the identification of knowledgeable individuals, including those with intergenerational ties to the area. Additional insights were drawn from informal conversations with residents and local officials, although these were not formally recorded or included in the core interview dataset.

Each interview was audio- or video-recorded with informed verbal consent, transcribed, and translated from Turkish into English. Translation retained

Table 1.2 Characteristics of the interviewees with the dates and number of interviews (Aktürk & Fluck, 2022)

Interviewee	*Gender*	*Profession*	*Villages*	*Date*
B.U.	F	Retired/primary school teacher	Çağlayan	10.01.19
A.S.	M	Stone mason	Beydere	11.01.19
S.Ş.	F	Retired	Çağlayan	11.01.19
Y.Y.	M	Teacher	Fındıklı center	11.01.19
F.H.	F	Retired	Çağlayan	12.01.19
M.A.	M	Retired/post officer	Çağlayan	12.01.19
Ş.S.	M	Stone mason	Fındıklı center	14.01.19
H.Ş.	M	Retired/primary school teacher	Çağlayan	30.06.19
S.T.	F	Housewife	Gürsu	02.07.19
T.H.	M	Retired	Gürsu	02.07.19
C.K.	M	Retired/primary school teacher	Hara	03.07.19—3 interviews
G.A.	F	Retired	Hara	03.07.19
Y.G.	M	Retired	Çağlayan	05.07.19
Ş.Ö.	M	Land registry	Çağlayan	06.07.19

key vernacular terms to preserve cultural nuance, especially in references to building techniques and local materials. Interview content was organized around seven core themes: local climate, vernacular heritage, observed climate impacts, anthropogenic pressures, disaster events, preservation challenges, and cultural resilience. These themes were further broken into 29 sub-categories and analyzed using the qualitative data software ATLAS.ti.

The interviews yielded rich narratives on the lived experiences of climate variability, historical memories of disaster events, and vernacular responses to environmental change. Craftspeople, in particular, emphasized the continuity of traditional knowledge systems, such as wood carving and dry-stone wall construction, which have proven resilient under certain climatic conditions. These oral histories also underscore generational differences in attitudes toward heritage preservation and climate adaptation.

The ethnographic data reveal that while residents acknowledge the accelerating pace of climate change, responses are shaped by both material constraints and socio-political dynamics. Residents in more disaster-prone areas like Beydere reported higher instances of displacement and infrastructural failure, while villages like Hara and Çağlayan highlighted the gradual erosion of vernacular skills due to outmigration and inadequate institutional support. Conversely, some residents pointed to their adaptive use of heritage buildings as evidence of living resilience, despite the absence of formal policy guidance.

The interviewees were asked about local livelihoods, major climatic hazards, coping strategies, and how the residents of historic buildings respond to the current changes.

Aside from the 14 interviewees, a scholar, a local truck driver, and a local administrator were not initially considered for the interviews, but participated in the conversations during the case study visit. These individuals volunteered to give some information without being listed in the record of interviews. Thus, they are anonymised and are not officially considered in the list of interviewees. However, their statements gave insightful information, which is why they are referred to (see Chapter 4).

The interviews conducted as part of this research provided vital insight into the evolution of vernacular built heritage in Fındıklı's hinterland—information often absent from archival records, maps, and official documentation. These conversations captured the oral histories of cultural heritage and local accounts of recent climate-related events, filling critical gaps in the material record. Through an inductive thematic analysis, the responses revealed lived experiences, personal memories of climatic shifts, and recollections of disasters and their impacts. The numbers (n) indicate how many interviewees referenced each theme, reflecting the salience of specific topics across the dataset.

Importantly, these narratives are not monolithic but vary significantly between villages and across the broader Rize region. The perceived impact of climate change, as well as the value attributed to heritage preservation, is shaped by a range of factors, including settlement typology, socio-economic conditions, and levels of urbanization. In more urbanized centers, climate impacts are often mediated through infrastructural change, while in traditional settlements, shifts are directly observed in the land, architecture, and daily practices.

Given the research's focus on cultural landscapes, particular attention was paid to the experiences of residents inhabiting historic mansions and other vernacular buildings. As primary custodians of the region's cultural heritage, their perspectives are especially valuable for understanding the nuanced interplay between climate vulnerability, heritage resilience, and everyday life. These insights contribute to a more situated and locally grounded understanding of how traditional knowledge and cultural identity are negotiated under changing environmental conditions.

1.4.3 Additional Sources

In addition to mapping and interviews, the literature in the field of climate change, cultural heritage, and disaster risk management globally was reviewed. In order to understand the context of the main case study area, extensive studies by prominent Turkish scholars and architects were referred to, such as Orhan Özguner from Middle Eastern Technical University, Mustafa Reşat Sümerkan and Hamiyet Özen from Black Sea Technical University, Cengiz Eruzun from Mimar Sinan University, Necati Şen from Istanbul Technical University, and art historians such as Seyfi Başkan from Ankara Hacı Bayram Veli University, Haşim Karpuz from Atatürk University, and many more. The

documents and reports from governmental institutions, especially from the AFAD and DSI were also reviewed in the scope of this research. Despite the clear distinction between the works of the two institutions, Rize Provincial Directorate of Environment, Urbanization, and Climate Change has become the most influential actor in the governance of climate change at the city and local scale. Thus, their documents and action plans are used in the interpretation of the findings. Popular magazine articles, documentaries, and books also contributed to understanding the intersections of various fields on this topic.

Printed archival sources were rarely available in the case study area. Nevertheless, sources from national and local institutions were used in the analysis, such as the public records of the Presidency of the Republic of Türkiye, the public library of Fındıklı, the provincial public library of Rize, and the library of the Ministry of Culture and Tourism. The books published by local authorities were used to provide information on the geography, economy, and culture of the city and the district. For instance, the past records of disasters in Fındıklı of Rize were collected from the local newspaper of the *Viçe* and the General Directorate of Water Works (DSI). The latter has dealt with the planning and rehabilitation of water resources. The use of library sources and records of local newspapers revealed some evidence of past events such as flooding and landslides and the damage that resulted. In addition, meteorological information, which is now available online for cities around the world, is used as a supporting source for this book.

1.4.4 Limitations

This book acknowledges several limitations:

- The case study approach may reflect interpretive biases inherent in single-researcher studies.
- Archival data from local institutions in Fındıklı are limited and often incomplete.
- Meteorological data is relatively recent and does not fully capture long-term trends.
- Interviews were conducted in an informal, conversational style, which may have shaped responses. While some interviewees were homeowners, others were farmers or residents with varying degrees of knowledge about climate change.
- Geographical constraints and limited access to certain sites also posed challenges.

Nevertheless, these limitations underscore the importance of qualitative, localized research in contexts where data may be scarce, but lived experience is rich.

Case comparisons in this case are not made in a homogeneous manner, as there are methodological differences. Secondary sources were used to understand the context of the global cases; however, their reliability varied. Cases that attracted greater global interest had more extensive literature available, while others were less documented. Additionally, the lack of English-language sources hindered a deeper analysis of some cases.

These comparative cases serve as a reference point for vernacular landscapes at risk of climate challenges rather than as comparative studies. Considering the differences of geographical, social, and economic aspects, let alone different climate challenges, these sites show some similarities in terms of resilience of vernacular landscapes in a global context.

1.5 Book Structure

This book comprises seven chapters, including the introductory and concluding chapters. Aligned with the overarching objective, each chapter addresses key research questions thematically while maintaining a chronological framework that reflects the historical development of events and processes. The emergence of vernacular heritage in the study area dates back approximately 200–250 years, whereas the impacts of climate change have only become widely acknowledged in the late 20th century. To accommodate these differing temporalities, the chapters are structured across distinct historical periods.

The book spans roughly 300 years, beginning with the late Ottoman era (1800–1923) to provide historical context on the origins of vernacular landscapes (Chapter 4), followed by an examination of the human-induced transformations between 1950 and 2019 (Chapters 5 and 6), and culminating in a discussion of climate-related threats in the present and near future (Chapter 7). This temporal segmentation is guided by key milestones that significantly shaped the built environment and its vulnerabilities.

Given the complexity of climate change, which operates at global, national, regional, and local scales, each chapter zooms in and out of these levels of analysis, depending on the thematic focus. The dynamic relationship between vernacular landscapes and their destruction—whether due to development projects, homeowner-led alterations, or climate-induced impacts—is examined at both spatial (regional, city) and local (building) scales. Spatial planning decisions refer to macro-level transformations, whereas local practices are more concerned with micro-level changes, often carried out by residents and building owners themselves.

While there is some thematic overlap between chapters, particularly between Chapters 4 and 7, which both discuss lessons for climate resilience, each addresses a different time frame and analytical focus, offering unique insights into the evolving challenges of preserving vernacular heritage.

Chapter 2 introduces the key concepts and terminologies relevant to the study of vernacular architecture and its place within broader heritage

discourses. It frames vernacular architecture as a form of *living heritage*, inherently linked to local climatic conditions. Drawing on global examples, the chapter examines the relationships between vernacular practices and environmental adaptation. The chapter also introduces foundational climate change concepts, such as climatic challenges and disaster risks, and explores the implications of these phenomena for the management of cultural and vernacular heritage. The chapter concludes with an overview of how climate change affects heritage sites and assesses contemporary approaches to risk management in this domain.

Chapter 3 provides the contextual groundwork for the case study. It outlines the geographical, climatic, historical, and socio-economic characteristics of the selected city and district, offering a comprehensive overview of the physical and cultural setting. This includes an examination of the administrative structure and the architectural features specific to the vernacular heritage of the region.

Chapter 4 draws on literature and interview analysis to explore how local climatic conditions historically informed the construction of vernacular settlements in the region. This chapter identifies features that historically enhanced climate resilience and discusses how these architectural strategies were embedded in local building practices.

Chapter 5 shifts the focus to regional spatial planning decisions, such as urbanization, river modification, coastline transformation, and deforestation, that have amplified the region's vulnerability to climate change. The analysis incorporates historical cartographic comparisons (e.g., overlapping maps from 1969 and 2019) to illustrate large-scale environmental changes. It also evaluates major development projects such as hydroelectric power plants and the Green Road Project, drawing on existing literature to identify the spatial threats posed to vernacular heritage.

Chapter 6 addresses preservation challenges at the local level. Through interviews with homeowners and farmers, the chapter investigates the material degradation and loss of rural built heritage that have occurred since the 1950s. It shows how grassroots alterations and lack of maintenance have accelerated the deterioration of these buildings, revealing how bottom-up practices—while often driven by necessity—can contribute to heritage vulnerability in the face of climate change.

Chapter 7 offers a forward-looking assessment of the likely future challenges posed by climate change. Drawing on the perceptions and views of stakeholders and analysis of the future climate risks, it evaluates anticipated risks to vernacular heritage and assesses the adequacy of existing disaster risk management frameworks. This chapter critically examines whether these traditional buildings retain their climate-resilient features today and evaluates the preparedness of current heritage management strategies.

Chapter 8 concludes the book by synthesizing findings and articulating the study's contribution to the fields of heritage preservation and climate change adaptation. It reflects on the implications of the study for future research and

policy, emphasizing the need for integrative, context-sensitive approaches to managing climate risks in culturally significant environments.

Although parts of this book are based on previously published materials, they have been substantially revised and updated to reflect ongoing academic discussions. Chapter 2.4, for instance, addresses a research gap in the existing literature, which often relies heavily on quantitative approaches such as GIS, statistical models, and spatial analytics. While valuable, these methods frequently overlook the qualitative dimensions of climate change impacts on cultural heritage. In contrast, this book adopts a complementary methodology that incorporates local perceptions, values, and experiences, thereby enriching the dialogue on how communities engage with their built heritage under shifting climatic conditions (Orr et al., 2021).

Notes

1 European Landscape Convention, adopted by the Committee of Ministers of the Council of Europe in Strasbourg on 19 July 2000, and opened for signature in Florence on 20 October 2000 (Council of Europe - European Treaty Series no. 176).
2 The title of the Ministry of the Environment and Urban Planning has changed to the Ministry of the Environment, Urban Planning, and Climate Change (decision number 31643 of October 29, 2021, "Cumhurbaskanligi Kararnamesi"). See: https://www.resmigazete.gov.tr/eskiler/2021/10/20211029-35.pdf. Accessed 28 January 2022. The decision was given after Turkey rectified the Paris climate agreement on October 6, 2021.
3 This book is based on the previously published thesis with the title "Climate Change and the Resilience of Collective Memories: The Case Study of Fındıklı in Rize, Türkiye" (Gül Aktürk, 2023).
4 The meeting was held between December 6 and 10, 2021. https://www.ipcc.ch/event/ipcc-icomos-unesco-co-sponsored-meeting-on-culture-heritage-and-climate-science/.
5 Ladakh is surrounded on the east by the Tibet Autonomous Region, on the south by the Indian state of Himachal Pradesh, and on the west by Pakistan's Gilgit-Baltistan, which extends from the Siachen Glacier to the main Great Himalayas. It is in a conflicted zone, which will not be discussed in the scope of this research.

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2 Definitions, Concepts, and Theories

2.1 Introduction

This chapter explores the definitions, concepts, and theoretical foundations of vernacular landscapes as a form of cultural heritage and climate change. It first tracks the origins of vernacular landscape and then elaborates on the concept as a form of heritage with an emphasis on its living dimension. The concepts, terminologies, and theories of climate change and disasters, which evolved separately from heritage studies, are defined and contextualized in this section. Despite using the same terminologies for different meanings in each discipline, there are some interlinkages in theories that complement one another. By doing so, it sets the background for the review of the literature on challenges of climate change and disasters and how those impact heritage. The vulnerabilities of cultural heritage and resilience of it are discussed using examples from the literature review. This chapter concludes by examining the global challenges associated with preserving vernacular landscapes as a heritage, and how these landscapes are impacted by climate change and disaster risks. It also emphasizes the inadequacies in the current approaches to addressing climate change and other disasters in vernacular landscapes and how lessons learned from the example cases can inform policymakers in climate adaptation and disaster risk management. The vernacular practices may generate new ideas through critical reflections on their local characteristics.

2.2 Framing Vernacular Landscape: Definitions, Concepts, and Theories

Vernacular architecture has always been unique to the context in which it is situated. Its construction was born out of the needs of local communities. Unlike other architectural design styles brought by grand architects of the time, vernacular architecture is constructed by lay people in response to the context of a particular place and time. The term "vernacular" is commonly used in linguistic studies to mean a form of expression, language, or dialect in a particular region. Derived from the term *vernaculus,* it refers to the native, domestic, indigenous, authentic, folk, peasant, tribal, and local

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practices. Particular to a specific location, local communities built vernacular settlements compatible with the natural environment, including geographical, climatic, and topographic conditions, in addition to cultural, socio-economic, and intangible values. Therefore, it is "contextualized" architecture emerging from the concept of *genius loci*, introduced by Christian Norberg-Schulz in 1981 as an approach representing the sense people have of a place, as stressed by Hubert Guillaud (Guillaud, 2014). *Genius loci* requires insightful knowledge that derives from experiencing the place, culture, and values of local communities to understand the particularities of the vernacular architecture in the area.

The interest in vernacular architecture grew with prominent figures such as Bernard Rudofsky, Amos Rapoport, Eric Mercer, Henry Glassie, and Paul Oliver starting in the last half of the 20th century, even before the rise of environmental concerns in the 1970s. Paul Oliver, an English architectural historian, acknowledged that there is a need for understanding the cultures and values behind the production of vernacular buildings through interdisciplinary approaches, including anthropology, archaeology, architecture, landscape, and environment (Oliver, 2006). In his book and exhibition in the MoMa, *Architecture Without Architects* in 1964, Bernard Rudofsky, an Austrian architect, engineer, and critic, noted that vernacular architecture never falls out of fashion as there is always wisdom derived from the practical solutions of primitive architecture constructed by "untutored builders" (Rudofsky, 1964). His view of vernacular architecture, indigenous science of construction, emphasizes the ancestral knowledge passed from generation to generation in the construction of vernacular. Along the same lines, Henry Glassie stresses that the wishes and the needs of its users and builders can be viewed as one of the critical ingredients of vernacular, as it involves the use of local materials and the direct touch of hand (Glassie, 1990).

Due to its association with indigenous and marginalized communities and cultures, the term "vernacular" is seen as contested as it recalls the period of colonialization. The house of *verna* in Latin, as Guillaud argues, connotates "slave born in the house" (Guillaud, 2014). In this sense, Kusno makes similar observations in the composition of colonial-vernacular houses by stating that "the vernacular environment can be conceived as a constructed life of (once) marginalized communities (e.g., indigenous people)" (Kusno, 2020). The critiques over the influences of colonization, though are not the focus of this book, are something to be aware of in analyzing vernacular landscapes.

The term vernacular is often misunderstood and ill-defined, as it is often used interchangeably or in the same way as "traditional" by architectural historians and architects. Traditional existed in accordance with a tradition, and thus it is habitual, conventional, customary, and established. But it is also perceived as fixed, which contradicts the contemporary view of the term vernacular. The vernacular, in this view, is often exposed to change and innovation (Heath, 2006). It is fluid and far from being fixed as it shape-shifts

with intergenerational knowledge and styles developed over time. Henry Glassie, an American anthropologist, suggests tradition as "the creation of the future out of the past" (Glassie, 1995). This definition has a strong correlation with how vernacular is perceived.

Vernacular architecture, with its generational cultural practices, traditional construction systems, and crafts, is an important part of cultural heritage and cultural landscapes. Cultural landscapes, including cultural and natural resources, are the symbiosis of nature and human activities. It is the entire space surrounding vernacular architecture, including landscaping, cultivation of lands, fauna and forests, river alleys, and coastline, that provides the characteristics of a vernacular landscape. In fact, "vernacular architecture and cultural landscapes are one and the same space which links nature and culture and which must be conserved and passed on to future generations," as put by Hubert Guillaud (Guillaud, 2014). The National Park Service (NPS) in the United States recognizes historic vernacular landscape as a form of cultural landscape among other forms, including historic sites, historic designed landscapes, and ethnographic landscapes, and describes it as:

> a landscape whose use, construction, or physical layout reflects endemic traditions, customs, beliefs, or values; in which the expression of cultural values, social behavior, and individual actions over time is manifested in physical features and materials and their interrelationships, including patterns of spatial organization, land use, circulation, vegetation, structures, and objects; in which the physical, biological, and cultural features reflect the customs and everyday lives of people.
>
> (National Park Service)

Vernacular landscapes reveal how the understanding of material culture and the process of construction is inherited, transmitted, and evolved (Bronner, 2012). Vernacular landscapes can be part of the urban context as well as rural. Vernacular landscapes revolve around the socio-economic activities, land use, livestock, farming, biodiversity, fauna, habitats, wilderness, and intangible values. Understanding vernacular landscapes as a form of cultural heritage contributes to their preservation by ensuring the core aspects of their significance are preserved. The concept of cultural heritage is defined as "our legacy from the past, what we live with today, and what we pass on to future generations" by UNESCO (UNESCO, 2008). For a long time, cultural heritage has been conceptualized as separate entities, including objects, buildings, sites, properties, and other, mainly "tangible" forms. The understanding of the term, then, has further extended to the "intangible" forms by considering traditional knowledge systems, language, expressions, and cultures. Cultural heritage is about inheritance and legacy and recognizing our past, culture, and identity—both personal and collective. Cultural heritage as a 'process' is emergent and routed through intangible experiences, skills, and attitudes toward resilience. Recognizing it, living in and with it, and promoting it is a

way of increasing awareness of it. The preservation of this heritage should be dealt with in a processual manner, which requires understanding micro-scale individual actions and lived experiences across multiple timeframes. There is also the time scale element to cultural heritage, which refers to daily, seasonal, and generational aspects of lived experiences.

Within this context, vernacular landscape and its preservation as a heritage have been recognized by the ICOMOS Charter on the Built Vernacular Heritage (ICOMOS, 1999). Agricultural practices, livelihoods, day-to-day habits, collective identity, and memories are deeply rooted in rural vernacular heritage. Rural vernacular-built heritage, such as countryside dwellings, farmhouses, and cottages, thus cannot be detached from vernacular traditions, everyday lives, and chores that revolve around these places. Therefore, the broadest understanding of vernacular landscapes as a form of cultural heritage better captures the interlinkages between communities, place, time, and practices. The identities of the place with shared work, shared social, cultural, and spiritual beliefs, and common ethnic and economic frameworks bonds, constructs, and shapes this collective heritage (Heath, 2006). Vernacular landscapes have been, and are still, part of dynamic processes with multiple sources of influences. It has been exposed to change and innovation, as it is constantly evolving, changing, and adapting. "Vernacular architecture is a continuing process including necessary changes and continuous adaptation as a response to social and environmental constraints" (ICOMOS, 1999). The building decisions behind vernacular design, then, are never coincidental or arbitrary. Conscious acts of vernacular design often continue with the incorporation of different materials and building techniques. These unwritten traditional techniques and practices were repeatedly and continuously replicated and refined by later artisans.

In light of current environmental debates, traditional ecological knowledge (TEK) of indigenous communities gained importance around the 1980s. TEK is defined in the many works of Berkes as a "complex body of knowledge, practice, and belief, evolving by adaptive processes and handed down through generations by cultural transmission, about the relationship of living beings (including humans) with one another and with their environment" (Berkes, 1993). Berkes' discussion of the concept as alternative knowledge systems not only offers diversity but also complements or sometimes challenges the "western scientific" knowledge systems. These indigenous knowledge systems—for example, from farmers, fishers, hunters, and gatherers—are characterized by generational accumulation and transmission of knowledge (Berkes et al., 2000). Berkes' notions of TEK invoke the vernacular in many ways. In thinking of the obvious link between these two concepts, two connections come to mind: (1) years of tacit knowledge developed through generations of living in close contact with their lands, and (2) a wide range of knowledge that is cost-efficient and practical. Articulations of knowledge systems belonging to the thousands of indigenous peoples behind the construction of vernacular landscapes, also mentioned as part of

the traditional knowledge systems, can be a great resource in tackling climate change effects. In addition, climate knowledge is culturally ingrained in the vernacular way of construction by previous generations along with other geographical, economic, cultural, and societal determinants of the place. It is important to emphasize that these climate experiences, memories, and perspectives in isolated rural places at a micro level experience do not reflect from backward-looking nostalgia but rather mobile nostalgia, which binds past, present, and future vision according to British geographer Alastair Bonnett and anthropologist Catherine Alexander (Bonnett & Alexander, 2013). Such claims underline the importance of vernacular landscapes in understanding the past and the present to draw conclusions for the future, and the ways in which vernacular histories are utilized in climate change adaptation.

2.2.1 Living Dimension of Vernacular Landscape

Living heritage is introduced by UNESCO to adopt a people-centered approach in the conservation of heritage. First identified in the context of intangible heritage, the concept was further elaborated to encompass the multi-layered dynamics of interactions between people and their living environment. Living heritage refers to "the practices, knowledge, and skills that have been passed from one generation to the next and are still in use today" (Wijesuriya, 2018). Living heritage is not a new concept, and in fact, it is a community-based approach (Poulios, 2014a). The concept recognizes the continuous process of evolving conditions of heritage (both in the tangible and intangible contexts). "Living" is added as a UNESCO World Heritage Site concept to heritage sites and practices that have been traditionally viewed as static (Poulios, 2014b). In an attempt to adopt the concept of living heritage for World Heritage Sites, heritage managers failed to take on board intangible values and traditions actively (Poulios, 2014b). This has resulted in disregarding the attachment of communities to heritage and their involvement in the management of heritage.

As opposed to elitist cultural heritage such as the World Heritage Site program, the preservation and management of vernacular landscapes have been in the hands of local communities. This is especially true in developing countries, even though public authorities of cultural heritage agencies manage vernacular heritage sites which are listed. It is "living heritage" when it is used, valued, and incorporated into today's living conditions. It is not "living heritage" if it is abandoned and left to decay. Living heritage is a concept developed by heritage institutions to make heritage relevant today. However, without any initiatives or incentives for supporting local communities, the introduction of new concepts and theoretical considerations given to this form of heritage will not tackle the issues of its preservation and adaptation. Recognizing the "living" dimension of heritage helps us embrace the diverse range of intangible heritage assets. As one example, living heritage, which

expresses locally rooted knowledge and practice, provides an important aspect of community-based resilience against changing climate conditions.

Even though vernacular landscapes are in many cases abandoned or disappeared, and with it, the artisanship, practices, and knowledge, local communities still hold memories of it. For many local people, it brings back nostalgic memories. For some, the vernacular houses they live in tell the story of when their ancestors first moved to the lands they now call their home. For others, it calls forth childhood memories of collective living. In developing countries, vernacular landscapes are still occupied by local residents and their management is under the responsibility of the homeowner/household and sometimes the tenant farmer. Vernacular landscapes, living or not, are in some ways fragile and in some ways resilient to climatic and other challenges. What this shows is that vernacular landscapes now need to be preserved, managed, and adapted to the conditions we face today and in the future.

2.3 Aligning CCA, DRR, and DRM for Heritage Resilience

Cultural heritage assets are increasingly threatened by various hazards, many of which are intensified by climate change. From floods, wildfires, and droughts to earthquakes and anthropogenic events like conflict, these hazards pose significant risks to the physical, cultural, and intangible dimensions of heritage. Despite this growing vulnerability, heritage studies have often lacked a robust conceptual framework for understanding and managing climate- and disaster-related risks.

Aligning climate change adaptation (CCA), disaster risk reduction (DRR), and disaster risk management (DRM) frameworks within heritage contexts allows for a more holistic strategy in strengthening heritage resilience (Aktürk & Hauser, 2025). While environmental scholars have critiqued the misuse of these concepts in heritage discourse, there is a need to recognize key concepts associated with theories behind these risks in order to communicate and manage climate change in a heritage context. Exploring climate change and disaster terminologies together helps promote an integrated approach. This is especially vital as communities in the Global South often face compounded challenges, poor management, economic hardships, and erosion of traditional knowledge.

The United Nations Office for Disaster Risk Reduction (UNDRR) defines a disaster as "a serious disruption of the functioning of a community or a society due to hazardous events interacting with conditions of vulnerability and exposure, leading to widespread human, material, economic and environmental losses and impacts" (United Nations Office for Disaster Risk Reduction (UNDRR), 2017). In the Global South, heritage loss often stems from inadequate planning, limited knowledge, and insufficient funding. The occurrence of disaster is always preceded by the existence of specific physical and social conditions that are generally referred to as disaster risk (Lavell Allan et al., 2012). Disaster risk emerges from the interaction of hazard, exposure,

and vulnerability, which extends beyond physical aspects to include social, economic, political, and cultural dimensions.

Vulnerability portrays what is at risk—a community, system, or asset—that is, to things of value that are exposed to hazards (Tierney, 2014). The framing of vulnerability in cultural heritage is beyond physical or structural deterioration, including the social and non-structural factors, and management and organizational structures dealing with hazards (Ravan et al., 2023). From a heritage perspective, vulnerability of heritage assets, systems, people's livelihoods, traditional and indigenous knowledge, skills, beliefs, cultural practices, solidarity, and social vulnerability are core elements of risk that are yet to be considered.

Neither the definition of disaster nor that of disaster risks necessarily addresses climate change as part of their definition. Viewed as a driver for disaster risk, the slow disaster of climate change is "a change in the state of the climate that can be identified (e.g., by using statistical tests) by changes in the mean and/or the variability of its properties and that persists for an extended period, typically decades or longer" (IPCC, 2012). Climate change gained momentum with the establishment of a UN body, the Intergovernmental Panel on Climate Change (IPCC), which determines the scientific body of knowledge on climate change. Climate change, often characterized as a slow-onset disaster, intensifies existing vulnerabilities through phenomena such as rising sea levels, temperature increases, and extreme weather events.

Climate change adaptation advocates efforts in reducing vulnerability or building resilience as a response to the impacts of climate change (Adger et al., 2007). Put simply, climate change adaptation demands changes in structures, practices, and processes to adjust to the effects of a changing climate. The concept of resilience, which dominates the field of disaster and climate change studies, is here defined as "the ability of a social or ecological system to absorb disturbances while retaining the same basic structure and ways of functioning, the capacity for self-organization and the capacity to adapt to stress and change" (IPCC, 2007). Strengthening resilience of cultural heritage for climate change is becoming more important in research and innovation. However, simply labeling heritage as "resilient" is insufficient; what matters are the actions and decisions that support resilience in practice.

Despite the overlapping goals of CCA, DRR, and DRM, these frameworks often remain siloed in both policy and practice. It may be due to the divergences between the two approaches. CCA is viewed as long-term, politically driven, originating from science, encompassing changes to average conditions, focusing only on climate-related hazards, and with sizeable and growing funding streams (Gero et al., 2011). Conversely, DRR includes geophysical hazards, builds on past experiences and knowledge, focuses on extremes only, has origins in humanitarian assistance, has relatively low to moderate political interest, and funding streams are ad-hoc and insufficient (Gero et al., 2011). DRR has a long record of local-level successful works in

reducing vulnerabilities of communities and supporting development, which could only be achieved based on past knowledge whilst considering future threats (Mercer, 2010). In this regard, the CCA discourse in the local context was found to be problematic as scholars studying DRR including climate hazards already stated this gap decades ago (Gaillard, 2022). Climate change tends to be addressed at broad temporal and spatial scales, while disaster risk is often localized and reactive. Bridging this divide is essential to effectively manage the multiple, interrelated risks facing heritage assets (Giliberto, 2021; Hallwright & Handmer, 2021).

The challenges that impede such integrated views are mainly because of their spatial, temporal, and focal differences. Disaster risks can have major impacts but a lower probability to happen. They tend to be more localized in terms of their impacts whereas climate change is analyzed in the long term at regional and national, if not global, scales. Disaster risks can be analyzed depending on past or present trends, whereas climate change impacts concern future probabilities. This integrated view of cultural heritage would require a bridge between policies, institutions, and communities. Short-, medium-, and long-term changes to cultural heritage due to various factors including climate change should be monitored (Jigyasu, 2019). The traditional local knowledge systems embedded in cultural heritage can inform disaster risk reduction and prevention via trial and error.

Existing guidelines from the UNESCO and advisory bodies such as ICOMOS, ICCROM, and IUCN have issued guidance "Managing disaster risks for World Heritage," on integrating DRR into the management of the World Heritage Sites, yet the practical implementation remains limited (Valagussa et al., 2021). Meanwhile, international initiatives like the Climate Heritage Network and World Monuments Fund have increasingly incorporated climate risk into their agendas.

At the national and regional levels, some countries, particularly in the Caribbean and sub-Saharan Africa, have made strides by developing integrated frameworks such as Joint National Action Plans (JNAPs), promoting cross-sectoral collaboration in heritage risk governance. However, at the local level, implementation remains fragmented, often due to a lack of coordination and awareness among heritage and environmental authorities.

Cultural heritage governance must become more inclusive and localized to effectively address climate and disaster risks. Projects such as the İzmir Declaration and the Climate change Risk Assessment Framework for cultural heritage in Turkey (CRAFT) exemplify efforts to empower local stakeholders and mainstream climate resilience into heritage management (United Kingdom Research and Innovation, 2025).

This book advocates for a cross-scale, multi-actor approach to heritage resilience, recognizing the crucial roles of national ministries, local governments, communities, and technical agencies. It also highlights the significance of water management institutions in mitigating flood-related risks and calls for greater coordination among stakeholders, including the Ministry of

Urban Planning, Environment, and Climate Change, the Ministry of Interior Disaster and Emergency Management Presidency (AFAD), the General Directorate of Water Works (DSI), the Ministry of Culture and Tourism, and local communities. By documenting the perspectives of diverse stakeholders, this research underscores the urgent need to embed cultural heritage within broader climate and disaster governance frameworks.

2.4 Challenges of Addressing Climate Change and Disaster Risks in the Management of Cultural Heritage

Climate change has been a growing interest in the agenda of internationally recognized heritage institutions such as UNESCO, ICOMOS, ICOM, and ICCROM as it infuses into different forms of cultural and natural heritage assets. The material and immaterial loss and damage to heritage were also recognized by the Intergovernmental Panel on Climate Change (IPCC). Since then, UNESCO opened the policy window on climate change and heritage management with the publication of *Predicting and Managing the Effects of Climate Change on World Heritage* (UNESCO, 2007b), which is a compilation of cases. It preceded a surge of publications by UNESCO and its advisory bodies in 2007, 2016, and 2019 (ICOMOS Climate Change and Cultural Heritage Working Group, 2019; Markham et al., 2016; UNESCO, 2007a). Within the policy agenda of UNESCO, as illustrated by early publications, World Heritage Sites became the focal point of the discussions around climate change. While the relevancy of cultural heritage in climate change was still questioned by many environmental scholars, these policies provided an evolving concept of cultural heritage, which refers to its vulnerability to climate change but also offers solutions for climate change adaptation and disaster risk management. The scope of the policies grew over time by touching upon multiple stakeholders, various heritage assets, direct and indirect consequences of climate change, and other disaster risks. The Climate Heritage Network (CHN)—a voluntary, mutual support network of government agencies, NGOs, universities, businesses, and other organizations—contributed to the strengthening of the network to tackle climate change effects on cultural heritage. Most recently, the joint expert meeting of UNESCO-IPCC-ICOMOS brought together scientists and experts to strengthen these interactions and investigate heritage- and culture-based actions for climate change adaptation and mitigation (ICOMOS, 2021).

In the literature, the field of climate change and cultural heritage starts to emerge only after the 2000s. What started as a fragmented, disciplinary, and compartmentalized field of research later different disciplines became closer and more interconnected. Its fragmentation is more visible in earlier studies where the focus is on a single area of expertise or distinct disciplinary methods and approaches. One common feature between the policies and literature on climate change and cultural heritage studies is that they examine specific cases and forms of heritage assets and time scales. Conversely, recent

movements push the field to further engage different stakeholders and their perspectives, values, and methods. Even though climate change and disaster risks have become the subject of numerous studies in the cultural heritage field during the past two decades, there has been a shift in understanding these challenges in a cultural heritage context. It is important to review key contributions in the field, which paved the way for the current understanding of climate change and disaster risks that will be further interpreted in the following chapters.

There is a great deal of specialized literature in the early years of the growing field on the individual risks of climate change on tangible cultural heritage. By providing quantitative assessments, such as climate modeling and meteorological input, many studies analyzed the deterioration of historic buildings and cultural landscapes in Europe (Bonazza et al., 2009; Sabbioni et al., 2006). An atlas of vulnerable cultural heritage sites in Europe assesses the potential risks that these sites are likely to face using various climate change scenarios (European Commission et al., 2010; Sabbioni et al., 2008). At a more micro-scale, the changes of indoor climatic conditions, such as humidity and temperature, and the damage arising from these changes in the interiors of historic buildings, were detected mainly in a European context (Bonazza et al., 2009; Brimblecombe, 2013; Lankester & Brimblecombe, 2012; Leissner et al., 2015). For instance, microbiological decay in wooden buildings is the most commonly seen problem in Norway, which requires building surveys to identify the biodeterioration causes (Haugen & Mattsson, 2011).

The majority of these studies focus on the vulnerability of World Heritage Sites by using climate modeling (Ciantelli et al., 2018) while some others analyze the effects of climate change on different types of World Heritage Sites, including the biodiversity of cultural landscapes (Samuels, 2017) and natural heritage sites (Perry, 2019). A spatial analysis of the World Heritage Sites located in the coastal areas of the Mediterranean found out that 37 sites were found to be at risk of flooding and 42 sites were at risk of coastal erosion, among 49 heritage sites that were surveyed five years ago (Reimann et al., 2018). The risk of flooding and erosion is expected to increase by 50 percent and 13 percent, respectively, until 2100 (Reimann et al., 2018). In Puerto Rico, 1,185 cultural heritage sites were found to be below 20 m sea level in elevation, 27 sites were inundated at the highest high tide in 2018, 56 sites are expected be inundated by mid-century, and 140 sites will be inundated by the end of the century due to sea level rise (Ezcurra & Rivera-Collazo, 2018). However, vulnerability of historic sites to physical impacts of climate change is closely related to adaptive, or in other words, coping capacity. In this sense, consulting with stakeholders can help determine the adaptive capacity for adaptation for a complete vulnerability assessment.

An analysis of semi-structured interviews with heritage stakeholders reveals the lack of knowledge of management methodologies incorporating climate change impacts as a barrier, even though heritage experts were aware

of a series of examples of best practices in adapting cultural heritage to climate change (Sesana et al., 2018). These interviews present barriers, enablers, and best practices in mitigating within the cultural built heritage sector by advocating retrofitting and/or refurbishment to increase the energy efficiency of historic buildings (Sesana, Bertolin, et al., 2019). Sesana and others further advocate mitigating and adapting around climate change in an integrated way, as opposed to understanding the individual risks of climate change on historic buildings (Sesana, Gagnon, et al., 2019). A conceptual framework is developed to incorporate a bottom-up component by interviewing stakeholders, which revealed a lack of awareness of climate change impacts on cultural heritage of decision-makers (Sesana, Gagnon, et al., 2019).

The landscape approaches in these studies have become prominent by assessing the effects of climate change on landscapes at the local level using GIS from the two cases located in the Dender basin in Flanders, Belgium (Dupont & Van Eetvelde, 2013). The vulnerability map produced from this study shows how climate change might affect the landscape as a whole, including the deterioration of forests, grasslands, and croplands (Dupont & Van Eetvelde, 2013). A similar study was conducted in coastal North Wales, United Kingdom, by using a two-step vulnerability index to first assess the vulnerability of archaeological sites and landscape futures and then calculate the vulnerability of the landscape character area, which reveals the loss and alteration of archaeological sites due to coastal processes (Cook et al., 2019). Sometimes, the landscape approach and territorial view of heritage is not utilized as a way to analyze vulnerability but rather as a way to adopt dynamic character of cultural landscapes in adaptive planning strategies and participatory climate adaptation policies (Shirvani Dastgerdi et al., 2022).

Studies conducting a systematic literature review shaped the direction of the field by calling for more attention to focus on the non-European context, climate change impacts on intangible heritage, interdisciplinary, multidisciplinary, and transdisciplinary research, and bottom-up approaches (Fatoric & Seekamp, 2017a; Orr et al., 2021). In some cases, the reviews explicitly focus on practical applications of methods and approaches to risk assessment (Bertolin, 2019; Bonazza & Sardella, 2023; Sesana et al., 2021) or specific forms of heritage in specific geographical contexts, such as in polar regions, which are often underrepresented (Nicu & Fatorić, 2023). Due to the close relation between heritage and tourism, the review of the impacts of climate change on tourism investigates how heritage tourism could be adversely affected by climate change while also contributing to it (Hall, 2016). Similarly, this review was interpreted in the Anthropocene to consider a unified approach to heritage and heritage tourism with the associated material and immaterial aspects of heritage (Hall, 2016).

Expert questionnaires identifying barriers to climate change adaptation have also been used in the context of low- and middle-income countries, identifying the underlying cause of lack of political recognition of coordination of climate change adaptation for cultural heritage (Daly et al., 2022).

Identification of these challenges, barriers, constraints, and their interdependencies to climate adaptation of cultural heritage at the policy and practice levels helped devise solutions to overcoming them (Fatorić & Biesbroek, 2020; Fatoric & Seekamp, 2017b). The traditional view of conservation in climate resilience policies published by UNESCO and its advisory bodies was criticized and questioned based on their systematic analysis; instead, a more territorial view of heritage resources is suggested to enhance disaster risk preparedness (Dastgerdi et al., 2019).

Policy analysis has also been conducted at an institutional level in the United Kingdom based on the example of the NGO Historic Environment (Cassar, 2005; Fluck & Wiggins, 2017) by presenting opportunities and advocating for the communication of the information to public. The role of Historic England and the wider heritage sector can promote the positive role of heritage assets in adapting to climate change; for example, shifting tourism, learning adaptive responses from communities, and new discoveries of formerly hidden archaeological sites due to coastal erosion or drought (Heathcote et al., 2017). A policy change is advocated, especially in the context of World Heritage Sites, for transformation by adopting a resilience framework not only to address the value of heritage but also to focus on transitioning heritage values (Seekamp & Jo, 2020). The analysis of the State of Conservation (SOC) reports of UNESCO World Heritage recommends connections between cultural and natural heritage in addition to the expansion of its significance at local, regional, and/or state levels to be able to update climate change policies of World Heritage Sites (Paloma et al., 2020).

Most of the effects of climate change on archaeological heritage have been analyzed in the Arctic (Barr, 2017), including coastal erosion, permafrost thaw, microbial degradation, vegetation increase, and tundra fires, in addition to impacts to tourism (Hollesen et al., 2018) and in Australia by measuring increasing sea level rise, storm surges, cyclones, tsunamis, and other effects on climate of anthropic influences (Rowland & Ulm, 2012). The results of such analysis revealed archaeological loss due to the combined effects of permafrost thaw, thermal and hydrological erosion, and oxygen exposure (Hollesen et al., 2017). Risk assessment maps are suggested to monitor changes in coastal and urban developments from past to present and future with other activities such as those that are related to agriculture, industry, and tourism (Rowland & Ulm, 2012).

In a chapter from her edited book with Joe Flatman *Archaeology in Society,* Archaeologist Marcy Rockman mentions the social implications of climate change, and the amount of effort that will be needed, from documenting artifacts, sites, and landscapes, to developing theoretical models that compile this data (Rockman, 2011). However, it is clearly a matter of communicating the knowledge in climate change policies, which is an ongoing effort (Rockman, 2011). Considering the shifting happening within climate and cultural heritage, some cultural heritage will likely be transformed into underwater cultural heritage, whereas underwater cultural heritage is likely to be

exposed, damaged, or moved (Perez-Alvaro, 2016). While sea level rise is anticipated to influence small island developing states (SIDS), the shift in the culture and cultural heritage of island communities is inevitable with the loss of their lands (Perez-Alvaro, 2016). Indigenous intangible heritage, in return, can help ease the process of such transformation by maintaining generations of knowledge, experience, and culture. Despite this, climate justice and the rights of indigenous people and their intangible heritage assets are largely ignored. As was suggested by some scholars, this value-based prioritization framework should take community groups into consideration to have a more fair decision-making process (Seekamp et al., 2020). Community engagement, cross-disciplinary approaches, and holistic views of heritage assets in all forms are effective approaches often advocated for by scholars to utilize in disaster management, adaptation, and resilience plans. Examples of these approaches can be seen in the cultural heritage of the Gullah communities of South Carolina and the diverse communities of Eleuthera, Bahamas (Brabec & Chilton, 2015).

In the last decade, research has recognized how the international legal framework addressed climate change on indigenous intangible heritage and suggests the utilization of indigenous expertise (Higgins, 2022; Kim, 2011) from the human rights perspective (Crowley, 2011; Maus, 2014). Intangible heritage has a strong value for communities and local people, which may transform (Henderson & Seekamp, 2018) or help them to form new attachments in the case of forced migration (Aktürk & Lerski, 2021). Workshops conducted with two Australian Indigenous rangers groups reveal the bottom-up and community approaches in understanding the perceptions of indigenous people toward climate change and its impact on cultural heritage sites (Carmichael et al., 2017, 2018, 2020).

The application of the value-based framework from the list of historic buildings included on the National Register of Historic Places in the United States can be used in vulnerability assessments to optimize climate adaptation strategies for heritage assets, which is based on interviews and workshops with experts (Fatoric & Seekamp, 2017a). A six-step vulnerability assessment of cultural heritage was developed by taking the value-based approach and implementing it at two case-study archaeological sites in Ireland, Brú na Bóinne and Skellig Michael. This type of assessment helps decision-makers prioritize and plan for climate adaptation (Daly, 2014).

These tools, combined with interdisciplinary analyzes, led to the creation of multiple models to assess the vulnerability of cultural heritage sites to disasters. The Multi-Criteria Decision Making (MIVES) methodology, which stands for the Spanish Integrated Value Model for Sustainability Assessment, is one used for the modeling of historic urban areas of San Sebastian in Spain to calculate vulnerability maps for flooding (Gandini et al., 2018). MIVES methodology is commonly used in the architecture, construction, and urban planning sectors to provide homogeneity to sustainability indexes (Gandini et al., 2018). Similarly, a multi-hazard risk assessment of natural hazards

(sudden- and slow-onset) with consideration given to the future effects of climate change is provided for the Historic Center of Rethymno on the island of Crete in Greece by analyzing GIS modeling, hazard mapping, and climate projections (Ravankhah et al., 2019). Multi-risk analysis has been developed for UNESCO heritage sites in the context of disaster risk reduction and disaster risk management, including the effects of climate change (Bosher et al., 2019). While the quantification of the disaster risks is often done for multi-hazard assessment, it is sometimes also completed during the investigation of one hazard type, such as flood risk, in multiple case study areas. For instance, hazard maps and vulnerability assessments of climate-induced hydro-meteorological hazards are created for monuments in Prague and Troja in the Czech Republic and Krems and Stein in Austria (Bonazza et al., 2021). In risk analysis, hazard mapping can and should be conducted in consultation with local experts and communities to better identify potential threats that could otherwise be ignored or underestimated.

Building on critiques put forward by scholars in critical heritage studies, heritage should be mobilized in "future-making." In his edited book *The Future of Heritage as Climates Change*, David Harvey considers heritage as a series of activities for the emergence of alternative practices, futures, and opportunities for communities to accept the changes in their surroundings (Harrison et al., 2020). Here, "heritage" is viewed as a future-making practice and reframed as a processual approach (Harrison et al., 2020). David Harvey and Jim Perry, British geographers who adopted a holistic view of heritage, accept the disputes over epistemological and ontological issues of understanding these concepts (Harvey & Perry, 2015). Importantly, Harrison looks at alternative heritage ontologies as the space in which futures are assembled, heritage as act of assembling, and assembling alternative heritages (Harrison, 2015). Loss and damage—consequences of climate change that can no longer be avoided—have also been recognized and accepted within the new heritage framework. Potential and actual losses of heritage arise from various kinds of extreme events, including but not limited to climate change. Alternative narratives of anticipating vanishing coastal heritage sites draw a connection with present and future transformation of landscapes (DeSilvey, 2012; DeSilvey & Harrison, 2020). Cultural heritage has been able to adapt and develop by embracing the uncertainties (Holtorf, 2018). The future of heritage should be creatively transformed along with the way we value and manage it (Holtorf, 2018). Heritage, as viewed through Sterling's lens, is critical thinking of Anthropocene to imagine new processes, ways, and forms of preservation and curational practices (Sterling, 2020).

2.5 Global Challenges of Managing Vernacular Landscapes

The modernization processes of industrialization and urbanization since the 19th century have adversely influenced many forms of cultural heritage, including vernacular landscapes. Before these processes, the agrarian and

handicraft economies were dominant. Prior to mass production in factories and the introduction of machines, highly skilled workers known as artisans made everything by hand. People produced food locally via small-scale farming, made clothing out of animal furs, and manufactured most goods in small workshops. At a time when simple tools and hands were used for the often slow and difficult production of goods, lay people constructed vernacular buildings, structures, furnishings, and objects with the materials available in their direct surroundings using techniques they developed that were passed down for generations. These low-tech building techniques were adopted and replicated across regions with slight differences tailored by and for local culture, customs, personal needs, and preferences. These vernacular settlements were still somewhat modest, representing the know-how building processes of indigenous construction techniques. To a larger degree, industrialization and urbanization disrupted the transmission of this intuitive and highly localized knowledge of where, how, and when to construct. With the abandonment of labor- and resource-intensive production, local people were no longer relying on traditional building techniques that were costlier and slower than mass production. As might be anticipated, globalization of cultural values caused erosion of the traditions of local cultures, identity, customs, and production. The weakening of cultural identities and loss of cultural values led to the abandonment of localities.

Vernacular landscapes are under threat of degradation, as they face challenges and pressures from industrialization, cultural standardization, homogenization, migration, environmental deterioration, and tourism. Subjected to rapid development, the depletion of natural resources in the name of urbanization is causing loss of natural materials, which were once used in the construction of vernacular heritage sites. Artisans' specialized skills are no longer appreciated as they once were, as their craft was based on a slower mode of manual labor that used the limited available resources. Replaced with faster and cheaper modes of work brought on by technological advancements, the craftwork of artisans has been rendered nearly obsolete. The prevalence of artisans who shaped stone, carved wood, or engraved ornamentations is diminished, as the cost of their manual labor increased, alongside the loss of natural materials used that are no longer available in the surrounding environment. But most importantly, the transmission of this local knowledge was interrupted. Younger generations do not hold the same traditional knowledge of crafts. The process of urbanization by creating economic opportunities drew people from rural areas to larger cities, which eventually led to the shrinking of rural communities. Out-migration of young generations, therefore, left vernacular landscapes and their associated intangible values abandoned, worsening their decay. Loss and damage of materials, maladaptation practices, and incompatibility with the use of new construction materials have led to the degradation of vernacular landscapes over time.

For their part, some local communities still appreciate vernacular landscapes while others do not recognize their full value. Meaning that, residents

value their vernacular houses, storage houses, and other buildings for different reasons, sometimes because of their memories attached to the site, their touristic value, their history, or the surrounding natural environment. Regardless, for a long time, the value of these spaces was not recognized by many locals because these heritage sites are privately funded and do not receive adequate maintenance funding. Often, many of these sites are not listed because local people think that once listed, they will be restricted in the restoration of these houses. Cultural heritage policies and legal obligations of safeguarding cultural heritage are making it harder for the owners to make any modifications to these sites. Additionally, the documentation of vernacular heritage sites has always been problematic because there is often a lack of texts, drawings, archival sources, or any other record of vernacular heritage sites showing the details of their construction date, builder, precise geographical information, or other information. Instead, this form of heritage relies on verbal statements, memories, and other oral and remembered information of local residents. This is also one of the reasons why there are few studies investigating vernacular landscapes under a changing climate.

2.5.1 Vernacular Landscapes *under a Changing Climate*

Alongside the challenges of various factors that threaten vernacular landscapes, climate change has emerged as one of the most pressing issues in preservation. Sea-level rise and coastal erosion wash away coastal sites, increased rainfall and flooding erode mud-brick vernacular houses, and building materials experience wear and decay due to climate-change-fueled extreme weather events. Aside from the physical loss, there is also the accompanying loss of knowledge and expression behind the construction of these buildings. There are many ways that vernacular landscapes are directly and indirectly affected by climate change. For example, changing temperatures may cause biodiversity loss, promote the spread of disease in forests, and contribute to crop failures in vernacular landscapes. In addition, changing climate conditions can cause insect infestations and invasive pests, changes in thermal comfort (including water-related conditions like dampness, condensation, humidity, or drought), and increased energy consumption due to the use of A/C as such in vernacular houses. In today's changing climate, vernacular landscapes may no longer be compatible with the local climatic conditions.

There are several cases where vernacular earthen constructions are deteriorating due to the interaction of increased rainfall with earthquakes. For instance, adobe and rammed earth structures in Tarma, located on the steep slopes of Peru, receive run-off water from the slopes, which exacerbates humidity and moisture issues in the foundation. In addition, water seeping through the roofs during extreme rainfall events causes further damage (Neumann & Localización, 2014). Revisiting the indigenous solutions of vernacular heritage sites may offer climate-resilient and climate-adaptive solutions if the changes driven by development are acknowledged as part

of its transformation over the years. Any alterations regarding the increase of insulations against humidity problems and installations of beams against earthquake risks and other reinforcements should be communicated through workshops to professionals (Neumann & Localización, 2014). To do so, local stakeholders should provide funding for this critical knowledge transfer.

The interest in vernacular landscapes has seen a resurgence in the age of climate change, mainly due to its value in demonstrating traditional knowledge and learned experiences from the past to implement in today's changing environmental conditions. Growing concerns over sustainability, circularity, and climate-resilient vernacular ways of design gained popularity for their environmental-responsive features in terms of using natural materials and techniques, energy efficiency, and internal climate comfort. Vernacular landscapes involve the inherent connection of space, climate, culture, and time. There is a wealth of examples from vernacular landscapes and their associated values that present innovative and valuable solutions to the problems we face today with changing climate (Rong & Bahauddin, 2023). However, the application of these knowledge systems into contemporary works of architecture and built environments has not been fully realized. Knowledge derived from vernacular landscapes can be utilized in contemporary settings to build suitable communities appropriate to changing climatic conditions. From water harvesting techniques to localized ways of designing roof structures, site layout, and building forms and orientations, vernacular landscapes offer design methods and solutions that account for the current time and space. While the interior comfort of these buildings has increased in importance, the analysis of the determinants of climate such as wind, temperature, and relative humidity revealed adaptive and ingenious solutions behind openings, windows, materials, and courtyards. The main takeaway from the analysis of these settlements, buildings, and practices on harnessing climate knowledge is supposed to help us in designing resilient cities. The question is, can such site-specific knowledge on climate-building relationships help us overcome the issues faced today? It remains to be seen, as studies that further establish the direct and comprehensive link between vernacular landscapes and climate change and other disaster risks are relatively few.

Example cases in the proceedings from the International Conference on Earthen and Wood Vernacular Heritage and Climate Change, edited by Marwa Dabaieh in 2021, illustrate the intersection between vernacular landscapes and climate change. For example, traditional roof construction in Sweden was negatively affected by climate change because adding the tar layer, applied to prolong the life of the wooden roof, has become expensive and labor-intensive (Strandberg & Balksten, 2021). Moreover, damage by storms, humans, and biological attacks that disrupted traditions thousands of years old was observed (Strandberg & Balksten, 2021). Similarly, in a case study for Pune, India, Kiran Shinde not only investigates the conceptual relation between disaster, disruption, and resilience but also illustrates the impacts of a 1961 flood and how the subsequent rehabilitation of the

damaged vernacular heritage sites resulted in various interventions to the houses, including unauthorized expansion. In the post-disaster recovery, homeowners reconstructed a new language of vernacular heritage shaped by their interventions to the buildings (Shinde, 2016). In their fieldwork, Elnokaly and Pittungnapoo used evidences from vernacular houses in Thailand to learn how to exist alongside water, especially in the rainy season. One example of this adaptation is the building of vernacular houses on stilts to allow for the flow of water underneath during flooding (Elnokaly & Pittungnapoo, 2022).

Conversely, newly urbanized areas today can be inundated when drainage systems are not properly functioning. Even though heritage sites in Sukhothai, Thailand are appreciated due to their indigenous design of water control and management, the authors suggest that the traditional knowledge should be combined with affordable technology (Elnokaly & Pittungnapoo, 2022). Another model illustration of the co-existence of water and earth comes from the example of Liang Village in China where local materials, such as brick and earth, are used to create tiles that drain water. In addition, "Bu" walls of closed residential units were built in a way to allow rainwater to flow away from the structure and prevent erosion (Shao et al., 2022). Despite the traditional wisdom that heritage holds, disaster risk prevention measures are needed to resolve water-induced degradation (such as erosion) and issues related to earth (such as cracking and dissolving of earth walls) (Shao et al., 2022).

2.6 Conclusion

Some forms of vernacular heritage sites are vulnerable to changing climate, while others are resilient to it. Vernacular landscapes hold climate-conscious knowledge, which can be harnessed in climate adaptation and the building of climate resilience. Increasing impacts from climate change, alongside other existing challenges of globalization, urbanization, maladaptation, incompatible interventions, and depopulation, are accelerating the vanishing of vernacular landscapes. By reflecting on the inherent relationship between climate and vernacular landscapes, one can generate the knowledge required to envision climate-adaptive solutions. When confronted with the challenges brought on by climate change and other disasters, the dynamics of the site with its surrounding landscape, including water resources, land, and social and economic conditions, should be taken into account. There are many examples worldwide where vernacular landscapes are endangered due to climate change; however, the literature is missing cases that exemplify these challenges and show evidence of climate-resilient features to generate knowledge for climate-adaptive cities. The presence of common challenges faced by vernacular landscapes across the globe does not, though, suggest a one-size-fits-all solution. Rather, these challenges should be shared with other knowledge holders and used for the transformation of cities to be more climate-adaptive and climate-resilient.

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3 The Identification and Characterization of the Primary and Comparative Case Study Areas

3.1 Introduction

Examples of vernacular constructions and representations from Fındıklı illustrate proven methods refined through years of practice. These customized works of rural communities, when utilized for inspiration, can serve as climate-resilient design strategies, which are also testimonies of community and local identity. From material selection to the architectural layouts, vernacular heritage is responsive to the needs of the particular location. The wisdom of vernacular construction, passed down over generations and surviving over time, is a reminder of the intrinsic relationship between nature and culture. In harmony with the natural environment and the local way of living, the vernacular landscapes of Fındıklı can only be understood within the context of the district's characteristics.

This chapter aims to capture the different vernacular constructions shaped by the local characteristics of the district and compare the environmental knowledge, practices, and adaptations of these constructions. It takes a look at the past construction practices and how those are interpreted and used today. These vernacular buildings are constantly adapted to suit changed or new uses over time. Some building design choices show resilience-building strategies while others include features that could not effectively recover from various climate stresses. The following provides an overview of the architectural context of Fındıklı and an analysis of various vernacular constructions in relation to their local area.

3.2 Administrative Structure

The administrative structure of the cities is different in Türkiye than in most European countries. The Republic of Türkiye has seven regions: Marmara, Black Sea, Mediterranean, Aegean, Eastern Anatolia, Central Anatolia, and Southeastern Anatolia. These regions are further divided into 21 sub-regions based on their geographic, demographic, and economic conditions. The country is divided into 81 cities, each divided into multiple districts. The Fındıklı district in the city of Rize is in the sub-region of the Eastern Black Sea

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of Türkiye. Fındıklı, therefore, is governed by its own local administration, including the district governor and the Fındıklı municipality.

3.3 Historical Overview of the Planning of the Rize and Fındıklı

Before the founding of the Republic of Türkiye in 1923, the Ottoman Empire used the Sanjak government, an administrative division of the Ottoman Empire for the governance of its cities. According to the organization of this former administrative system, Rize was part of Lazistan Sanjak, which was part of the eyalet of Trabzon. The status of autonomous sanjak existed until the end of the empire in 1923 and its abolishment in 1926. One year after the foundation of the Republic of Türkiye in 1924, Rize gained the status of city.

Fındıklı, was as a small fishing village known as Gavra until 1886, then became known as Viçe or Vitze until it became a district in 1948. Fındıklı, the Turkish translation of hazelnut, was the district of the city of Artvin from 1947 until 1953, when it became a district of the city of Rize (Yazıcı, 1984). 1924–1933, it was administratively under the district of Hopa, and between 1933 and 1936 it became under the city of Çoruh which combined the cities of Rize and Artvin. In 1953 it finally became a district of the city of Rize.

Rize, as the trading partner of Trabzon, was once a port city in the 19th century when its inhabitants engaged in maritime trade. In the city center of Rize, there were 36 neighborhoods, 3 sub-districts (nahiye), and 161 villages in 1891 (Çadırcı, 2011). Fındıklı was occupied by Russians from February 1916 to March 1918 after the Ottoman Empire lost the First World War (1914–1918). Russian soldiers attacked soldiers located in Hara and bombed settlements there in 1916 (Yazıcı, 1984). Following the years after the war, the population increase in the city of Rize was relatively small. In 1924, there were 221,150 people, of whom 126,733 lived in the center (Başaran, 2020). In 1926, the number recorded was only 232,380, which may not be reliable because the adverse effects of the war on the city, such as the poor economic conditions, forced people to out-migrate and not carry their records along with them (Başaran, 2020). The city's first population record after the Republic's foundation was in 1927, which showed out of 171,667, Fındıklı had a population of 9,939 (Başaran, 2020). The decreasing trend of the city population changed in 1950 when it reached 181,512 (Başaran, 2020). The population of Fındıklı, on the other hand, has steadily increased since 1927. Until the middle of the 20th century, the hinterland was more heavily populated than the coastal region (Eruzun, 1997), despite the wealth gained from maritime activities.

The ways in which vernacular settlements are positioned in rural policies, regulations, and laws remain a mystery, as little is known about the pre-industrial settlements under the administration of the Ottoman Empire (1299–1923).[1] Since 200 years ago state control has shifted from the Ottoman Empire to the Republic of Türkiye. Hardly constrained by rural

planning regulations and laws, the construction of vernacular settlements is portrayed through the narratives of constructors of previous generations. "Free-of-architects," the construction of the vernacular settlements was rarely influenced by planning authorities. Perhaps the first attempt at rigorous rural planning under Ottoman governance was in the mid-19th century, when a solution for immigrants was proposed (Eres & Akın, 2010).

Poverty forced people from Fındıklı to immigrate to the Russian cities of Soci, Rostov, Poti, and Sohum for trade, as well as to Crimea and Batumi in Georgia, which were located within Ottoman borders until 1878 (Turan, 2024). These immigrants opened stores, coffeehouses, bakeries, and other small businesses, only to later return to the city of Rize in 1915 at the onset of the Russian occupation of the city (Berber, 2011). With the earnings from these occupations, they built grand mansions with stonemasonry, especially in the districts of Çamlıhemşin, Hemşin, and Trabzon. Upon returning to their hometown, they soon found out that their properties were now held by the government in Batumi and Neva in Russia, which had taken custody of these dwellings in their absence. Some residents managed to reclaim their property ownership from these Ottoman institutions, while others were not so fortunate (Yücetürk, 2022). Upon their return to the city of Rize after the Russian Revolution of 1917 and following the Civil War, residents were confronted with challenges of overpopulation and financial crisis due to the failure of the main export crops, i.e., fruits and hazelnuts, in 1920.

In terms of the local economic conditions, customary agricultural practices, livestock farming, and small-scale fishing became the main source of revenue in the city of Rize as well as in the district of Fındıklı. Coastal land scarcity and steep and rugged terrains hindered industrial activities, particularly the transportation of goods in trucks, trains, or ships. Because the narrow coastal strip line did not allow for urban expansion, the majority of the population of Fındıklı was settled far from the central neighborhood, scattered among agricultural lands for the growing of crops such as orange, hazelnut, corn, and tobacco (lnandik, 1958). Even though corn plantations comprised more than 90 percent of land use before tea cultivation, the radical changes in the agricultural sector in Anatolia, which contributed to the development of the new nation in 1923, compelled residents to demand a change in crop choice. The frustration that accompanied labor-intensive corn plantations and the loss of its economic value compared to other products such as tea, hazelnut, and tobacco led to a natural yearning for a shift toward a tea-based economy. The high density of vegetation, consisting mainly of meadows and grass, was not always an advantage but rather a disadvantage, which required hard labor.

As observed by Joseph C. Grew, who was appointed as American ambassador to Türkiye in 1927, the city of Rize was seen as one of the poorest cities in the region (Güngör, 2018). His visits to the coastal towns of the Black Sea in August of 1929 aimed to determine methods to improve economic trade relations between Türkiye and the United States (Barış Ornarlı, 2022).

The less-industrialized city of Rize was losing its population, especially male workers to bigger cities like Trabzon where residents were moving in search of jobs, resulting in Rize's women participating substantially in farming activities (Özgüner, 1970).

The opening of the first known tea factory in 1947 in the coastal neighborhood of the city of Rize, which had a capacity of 60 tons/day, gave a boost to the local economy by creating hundreds of jobs (Yurtoğlu, 2018). By the mid-1950s, having been cultivating tea in area fields now for several years, locals realized that the physical labor involved in tea cultivation was much easier than growing corn, considering the hilly terrain (Alisan, 2013). In addition, the rise of state-supported initiatives led to increased demand for tea cultivation, resulting in more acreage dedicated to tea in order to meet the demand for this crop (İnal, 2021). Thus, the region became the foremost producer of tea in the nation, even though it would fall short of completing in the global tea market alongside China and India, mainly due to the high production costs and energy required (Yıldız & Midilli, 2022)

Since the early 1970s, declining income from tea production due to the inflation of the period caused Rize residents in the hinterland to migrate to the western cities of Istanbul, Ankara, and Trabzon, resulting in a shrinking population (Karaçimen & Ekin, 2025). Indeed, in 1980, while 56 percent of the total city population lived in the rural areas, 43.9 percent lived in the city (Nihan Ciğerci Ulukan & Umut Ulukan, 2018). The percentage of the rural population dropped significantly to 22 percent in 2012 and has continued to drop since then.

In 1980, there was a need for farm labor from outside rural households to support the management of small land holdings. Local people then hired Georgian farm workers to collect the tea and hazelnuts from their gardens. Since then, the income from tea cultivation has increased sharply. Law number 3092, enacted on December 4, 1984, turned tea production from a public entity to a private enterprise, which signaled the deregulation of tea (ul Haq & Boz, 2018). With this, the tea sector in Rize now faced competition from an increasing number of tea firms elsewhere. This shift to a reliance on tea brought profit as well as problems to the local economy. The ability of locals to utilize their property for tea cultivation brought significant changes to land use and cover in the region. These policies which paved the way for uncontrollable changes in the land use in the city of Rize have been a milestone in the acceleration of disasters today.

3.4 The Setting: Geography, Climate, Topography, and Socio-Economic Structure

3.4.1 The Black Sea

The Black Sea region, straddling the Republic of Georgia and Marmara region of Türkiye, consists of a dynamic mountainous landscape that is split

by rivers and streams running down to the Black Sea. The region comprises seven provinces, including Ordu, Giresun, Trabzon, Rize, and Artvin along the coast and the Gümüşhane and Bayburt inland. Running parallel to the Black Sea, the Pontic mountains, located in the Eastern Black Sea region, make up a rugged terrain intertwined with rich culture. With its highest peaks found in the Kaçkar mountains, this densely forested sub-range within the Pontic mountains draws its popularity for tourists from its pine, alpine, and chestnut forests found at various elevations, diverse biodiversity, undulating plateaus in the southern ranges (Somuncu, 2016), and the cultural significance to Black Sea people.

Rising abruptly from the narrow shoreline, the mountain ranges become steeper, higher, and narrower toward the east. For this reason, the Eastern Black Sea is the most mountainous and humid sub-region of the Black Sea (consisting of the Western, Middle, and Eastern regions). Kaçkar mountains present a stunning view of rural landscapes with trails descending from the rugged peaks, lush meadows, and clear lakes to the valleys. This landscape, comprised of streams feeding tea fields and lush and dense greenery surrounding vernacular houses and storage houses, supports the farm lifestyles and livelihoods of the local people who cultivate crops and livestock.

The Black Sea, which has low salinity, is fed by many major rivers of the region, namely the Çoruh River. The Pontic Mountains split these larger rivers into many tributaries, which have small drainage areas. The Eastern Black Sea Basin is a significant water source for the region due to the substantial amount of annual rainfall. The high-flow seasons of the rivers shape and maintain the flora and fauna surrounding the rivers and streams. The rivers overflow in summer months, especially in the months of July and August, following the melting of snow on the mountains (Yükseler, 2023).

The regional climate varies greatly from the coast to the inland. The coast has a typical oceanic climate with high humidity and rainfall. The prevailing winds are in the range of south-west-north directions (Sümerkan, 2008). In winter, snowfalls are quite common in December and March. In the hinterland, on the contrary, there is a transition from an oceanic to a continental climate. Summers are warm and dry, whereas winters are cold and humid. In this type of climate, the moderating effects of the seas that regulate temperature on the coast are no longer experienced, and instead, cold winds blow overland.

The mountain plateaus range in elevation from 1,500 to 2,200 m, and serve as a scenic attraction to travellers as well as an epicenter for the natural, cultural, and recreational touristic activities and farming life in the surrounding areas. Waterfalls, forests, lakes, natural parks, cultural heritage sites, recreational areas, and other natural heritage features of the region provide high tourism potential. These destinations offer a myriad of activities, including health and thermal tourism, winter tourism, summer pasture tourism, outdoor sports, river tourism (e.g., rafting), mountain tourism (e.g., rock climbing), parachuting, and bird observation (T.C. Kültür ve Turizm Bakanlığı, n.d.).

The rough and uneven pathways and foggy and rainy climate cause limited access to the remote areas in the hinterland.

The harsh conditions contributed to the difficulty in transporting goods and food between the mountain tops and plateaus, requiring residents to develop self-sufficiency in these isolated areas. With 70 percent of the regional population living in the hinterland, these villagers distanced themselves far from the city centers. Villages were composed of dispersed and scattered yet stratified settlements where communal and collective living was common.

This disconnectedness can also be seen in the simplistic style of living in vernacular houses, which differ from the coastal urban settlements. People's presence in the hinterland gave them access to the abundant resources of timber in the forest and quarry from the rivers to find creative solutions in the construction of mosques, schools, farmhouses, outbuildings, furnishings, household goods, and other materials and infrastructure. In addition, these circumstances prompted the development of stone and timber artisanship. However, intensive large-scale and long-term deforestation and occasional clearing from agricultural practices by local people laid bare these mountainous ecosystems, making them more fragile.

Diverse cultural groups, including Lazuri, Hemshin, Kurdish, Armenian, Greek, and Georgian, intermingle peacefully in this region. The diverse demographic structure of the region has resulted in a cultural mosaic with different ethnicities, languages, and dialects eroding and changing over time. This is visible in the disappearing trading and crafting practices of the settlements of the residents.

3.4.2 The City of Rize

Situated on the edge of a small bay along the coast of the Eastern Black Sea, the city of Rize has boundaries with the cities of Cayeli and Güneysu to the east, Ikizdere to the south, and Derepazarı and Kalkandere to the west. Covering a territory of 3,922 km^2 with a population density of 88 people per km^2, Rize has one of the smallest surface areas in the country (Bostan, 2008). In 2024, the city had approximately 352,453 inhabitants (*Rize Nüfusu*, n.d.). The city reaches its highest altitude of 3,937 m at the peaks of Kaçkar mountains and loses its elevation toward the south of Fındıklı (Rize İl Tarım ve Orman Müdürlüğü, n.d.). As the mountains range runs parallel to the sea, the city expanded in a linear way in the direction of east-west along the sea (Çakır, 2014). The districts of the city of Rize, in addition to Fındıklı, are Ardeşen, Çamlıhemşin, Çayeli, Derepazarı, Güneysu, Hemşin, İkizdere, İyidere, Kalkandere, and Pazar.

Rize's 80 km-long coast ranges from 20 to 150 m in width. The city's coast is divided at points by several streams (Çakır, 2014). Among the major rivers in Rize are İyidere (78.4 km), Fırtına (68.0 km), Sabuncular (46.0 km), Hemşin (38.5 km), Çağlayan (34.7 km), Taşlı Dere (34.0 km), and Arılı (31.5 km), which all empty into the Black Sea (T.C. Kalkınma Bakanlığı Doğu

Karadeniz Projesi Bölge Kalkınma İdaresi Başkanlığı, 2013). Among these rivers, the river of Fırtına has the highest flow rate and speed (T.C. Kalkınma Bakanlığı Doğu Karadeniz Projesi Bölge Kalkınma İdaresi Başkanlığı, 2013). The rivers of Rize are short and fast-flowing with relatively steep bed slopes (T.C. Kalkınma Bakanlığı Doğu Karadeniz Projesi Bölge Kalkınma İdaresi Başkanlığı, 2013). Aside from the topographic setting, the rivers of Rize in the Eastern Black Sea region played a significant role in the formation of fertile and forested lands with spruce and chestnut trees, used by local people in the construction of hinterland houses.

An increase in relative humidity accompanies the high-intensity rainfalls and precipitation year round, causing recurrent events of flash floods (Yüksek et al., 2013) and landslides in the city of Rize. The total annual mean rainfall amount reaches its peak, 650 mm, close to four times that of the rest of the country (Gürgen, 2004). Similar to the regional climate characteristics, the prevailing winds usually blow from the southwest, especially in the winter, while the west wind brings the most humidity and, therefore, extreme rainfalls. Strong winds that come off the Black Sea batter the coastal strip, leading to the coastline's gradual erosion. High winds affected the orientation of the vernacular buildings on the land. However, the rapid construction of new settlements on steep terrains in the hinterland diminishes the effects of strong winds from the Black Sea.

January is the coldest month in Rize with temperatures averaging around 4°C, and August is the warmest month with the highest recorded temperature of 21.4°C (Climate Data, n.d.). The average annual temperature is 12.5°C. Combatting the high humidity, which is frequently above 75 percent, the local meteorological station recorded the highest annual precipitation among the provinces, with 1,869.8 mm. The month of August receives the highest relative humidity (74.72 percent) and the most days with rainfall (22.73 days) (Climate Data, n.d.). The month with the lowest relative humidity is February (74.72 percent), while November receives the lowest precipitation levels (12.40 days) (Climate Data, n.d.). The rainfall seasons may change depending on the melting of snow cover. The addition of snowmelt can make river flooding more catastrophic, especially in the mountainous regions of the hinterland.

The shortest day of the year in Rize, winter solstice, usually falls in December. Characterized by its foggy sky, Rize receives approximately 6.15 hours of daylight in January (Climate Data, n.d.). Such weather conditions favor the existence of moisture-loving plant species. Frequent rainfalls help maintaining the consistent moisture and watering of the crops such as corn.

Traditionally cultivated in the hinterland of the city, corn has been surpassed in popularity by other crops such as tea, hazelnuts, and fruits alongside the growth of other local income sources, including fishery management and beekeeping. Small fish farming operations, especially those cultivating Turkish salmon (salmon trout) became quite a success, and now compete in the global salmon farming industry (Knudsen, 2025). Citrus fruits, kiwi, and

concord grapes became another source of income in addition to tea crops. To try to further improve agricultural activities, the young generation of the local residents, mostly women, participate in sustainable organic farming and livestock growing practices with the financial support of European Union funding projects. While growing citrus and kiwi competes with tea production in the growth of the local economy, fruits such as cherry, mulberry, grape, fig, walnut, chestnut, quince, medlar, and pomegranate do not have significant economic value (Arslantürk, 1986). Nonetheless, local inhabitants use beehives to ensure the productivity of these fruits.

While both citrus and tea thrive in environments with high precipitation, the latter in Rize supplies the need for one-third of the total tea consumption of the nation and a small part in exportation (Tekeli, 1943). A relatively recent development has been to avoid placing tea plantations in windy areas. Tea productivity relies much on the local characteristics of humidity, precipitation, soil fertility, and temperature, all of which are affected by the changing climatic conditions. Tea factories, from processing plants to packaging facilities, employed many people who are now retired. This has led tea farming to be the most prominent economic activity in the Rize region.

Recognized as a form of intangible cultural heritage since 2019 by UNESCO (UNESCO, 2023), transhumance, the seasonal droving of livestock, is also suitable in the mountainous regions of Rize, particularly in the summer seasons. The seasonal migration of local residents seeking pastures for sheep and conducting hay-making on mountain grasses as a preparation for the winter season became an additional economic activity (Somuncu et al., 2011). Local communities with their families move from their vernacular houses in the villages to their temporary residences on the higher plateaus for two months to care, breed, and manage their livestock. These high mountainous plateaus are known in local terms as *yaylas* for "summer pasture" (Özden et al., 2004). At the beginning and the end of this movement, there is a transition period of approximately 20 days spent in *mezra,* in other words, fertile land. It is located on terraces between the villages and plateaus (Demirel, 2010).

What the future holds for these forms of transhumance is unknown. Considering the effects of climate change on vernacular landscapes, the migratory patterns will continue to constantly change, creating new pasture routes. The practice of transhumance, as stated by UNESCO, has its own socio-economic system, from gastronomy to local handicrafts to festivities marking the beginning and end of a season. The whole system surrounding transhumance practice will be affected by climate-induced challenges, such as changes in pasture routes, availability of plants for grazing, conflicts arising from competition over pasture and water, loss of pasturing culture, over-tourism, and other challenges from deforestation and forest clearance of the hinterland. *Yayla* tourism became quite popular in areas like Ayder *Yayla,* where over-tourism threatens the local practice of summer pasture as local people try to avoid crowds in season.

3.4.3 The District of Fındıklı

The main case study area of the district of Fındıklı covers an area of 409 km^2 in the province of Rize in the sub-region of the Eastern Black Sea region of Türkiye (T.C. Fındıklı Kaymakamlığı, n.d.). As the farthest district from the center of the city, which is about 64 km away, Fındıklı's socio-economic situation differs greatly from the city.

Fındıklı has 23 villages and eight neighborhoods in which many settlements are dispersed along the sparsely-populated hinterland coast. Fındıklı has river plains and valleys that were formed by the three main rivers, from west to east, Arılı, Çağlayan, and Sümer. The rivers of Çağlayan, Arılı, and Sümer shape the landscapes of the villages in the hinterland. Most of the vernacular heritage is concentrated in the villages of Çağlayan, Beydere, Hara, and Gürsu. The topographies of the hinterland vary in the villages, especially those selected for the scope of this study. For instance, the biggest village in Fındıklı (Şevketbeyoğlu, 2017), Çağlayan, which was founded in the early 1800s, is 7 km away from Fındıklı's center (Mustafa Reşat Sümerkan, 2011) and sits at an altitude of 252 m. It is a lowland compared to Beydere village, which has the highest elevation with an altitude of 342 m (Elevationmap, n.d.).

Fındıklı has a population of 16,678 residents (TUİK, 2019), including well-educated elites taking the roles of teachers, administrators, civil servants, and artisans. Perhaps the employment outside agricultural activities could be explained by the lack of capital from smallholder farming. Historically, the district has had a population of well-educated civil servants (Şevketbeyoğlu, 2017) who owned large-scale lands and mansions. Unlike the rural vernacular settlements in the villages, these mansions are more grandiose and belong to the elites. Income from farming and livestock raising alone is not enough to prevent population loss from these rural areas. There is a small number of young people who engage in various family-operated artisan pursuits, such as textiles, food processing, and handicrafts. To describe the depopulation of the rural areas, a local mentioned that only half of the population remained in the villages after people left to search for jobs in the western cities.

Agricultural activities in Rize annually bring approximately 32,000 tons of tea crops, 750 tons of hazelnuts, 1,350 tons of milk, 60 tons of meat, 200,000 eggs, and 10 tons of honey, while 40 tons of catch from various fisheries, especially anchovies and bonito, are caught from coastal fishing (Vikipedi, n.d.). Small-scale farming, considering the hard work of collecting the crops, is not worth the effort as it does not provide sufficient economic gain. These economic hardships pushed local people to co-live in the same households for a long time. This need prompted the collective construction of the typical vernacular houses, which were more practical given the large family structures.

In time, Fındıklı people switched from large households encompassing multiple rooms to accommodate multiple generations in favor of small

family structures (Fındıklı Kaymakamlığı, 2017). Nowadays, these excess bedrooms are either unused or changed in function. The values of local communities around kinship, religion, morals, status, hierarchy, and authority were influential in both private and public lives in the past. Although elders still practice religious rituals and family gatherings, there is an abandonment in the continuation of these ceremonies in the current generations. Not only is there an abandonment of cultural values, but there is also an abolishment of artisanship, which was once valued by the local population. Vernacular landscapes evolve with the continuation of such intangible expressions as timber artisanship, stone masonry, coppersmithing, basket making, weaving, hawk-eagle raising, and cornbread making, in addition to other representations of the area's food and culture (Karpuz, 1992).

3.5 The Characteristics of Vernacular Architecture in Rize and Fındıklı

Suha Arin's 1986 documentary *Sisler Kovulunca/Geleneksel Karadeniz Evleri Belgeseli* examines the apprenticeship and the building masters behind the construction of traditional vernacular houses in the Eastern Black Sea region (Arın, 1986). One of the most memorable lines from the closing lines of the documentary comes from an interview with an artisan, Ali Riza Usta, who reveals that he prefers traditionally built vernacular houses over modern buildings and thus refuses to enter his own son's house:

> From that house [referring to the modern house constructed by his son] one's corpse comes out. I do not enter that house. If anyone enters that house, that person would be a doctor [meaning that being too exposed to humidity can cause illness, especially from respiratory problems, considering that modern building materials are not as climate-comfortable as traditionally built vernacular houses].
>
> (Arın, 1986)

The resilience and sturdiness of these buildings rely on several factors, including the site selection, the layout of walking paths, the location and orientation of buildings, the design of building elements, and building typologies. The traditional vernacular landscapes of the region have components of rural lifestyles, e.g., mosques, stone bridges, traditional stone-infilled timber houses, mills, storage houses (locally known as *serander* or *nayla*), kilns, fountains, wood-fired ovens, and barns with fruit gardens and land holdings. When a service is provided for the "village house," such as barns and outdoor ovens, this facility becomes a separate entity and hence called "house (Tuztaşı et al., 2014)." Oven house, bride house, bread house (bakery), barn house, courtyard house, and storage house are examples of places where rooms have a function of their own within the houses, thus inheriting the name of "house."

It is important to recognize the difference between modest vernacular houses in the hinterland constructed by villagers and grand *mansions* built by wealthy families. As opposed to the simplistic and modest design of typical vernacular houses in the villages, grandiose vernacular *mansions* stand out with their sheer scale, sometimes including more than ten rooms, intricate craftwork, and other architectural and design details, making them rural landmarks. Interviews with the current owner of a coastal mansion indicated that their ancestors built these mansions from fishing and sea trade. According to their statements, the old coastal mansions were built with timber, except for the wealthy families who had the means to build their mansions with brick. In the case of the two mansions, the mansions were grand not only in scale but also in interior elements, such as impressive circular stairs. These types of mansions, aside from a view of the Black Sea, were not similar to the folk architecture in the hinterland. These sea-front mansions were destroyed during the reclamation of the coast in the region (as explained in Chapter 4) during the construction of the coastal road.

The hinterland and its cultural heritage have become more prominent in Rize. The local economy grew alongside agricultural activities in the hinterland. The inequity in the distribution of economic development was reflected in the typology of cultural heritage in the construction of seafront mansions and rural vernacular houses in Rize. The number of the listed urban cultural heritage properties did not outgrow the number of listed rural cultural heritage properties (Aktürk, 2023). While the urban development on the coast has resulted in the loss of seafront mansions, the hinterland remained largely untouched, contributing to the tourism value of vernacular houses.

Private-owned small landholdings in the rural landscape include building plots, arable land with corn, tea, and hazelnut fields, and livestock. Villagers store nuts, corn, dried vegetables and fruits, and grains in timber cupboards in their timber-built storage houses, which are constructed on four to six timber pillars. The timber wheels around these pillars and the interrupted timber stairs of the freestanding storage houses are built to prevent animals from climbing up and damaging the stored foods. Thanks to their modular design, these storage houses, located next to the vernacular buildings, are easily assembled, demountable, and portable, offering flexibility. Built with a construction system using no studs, the storage houses can endure the prevailing winds. Their wide overhangs specifically aim to keep food secure from the frequent rain.

The rural vernacular settlements are sparsely scattered with kilometers of distance between the buildings (Özgüner, 1970). Despite the distance, collective living, kinship, and communities built small clusters within the villages. In some areas, there are small and compact neighborhood units, such as in Çağlayan village, which consists of a couple of buildings and storage houses next to each other (Özgüner, 1970). This type of settlement contributed to the formation of small streets between these buildings (Özgüner, 1970).

Rural vernacular houses are generally built with two or three floors, with the ground floor used as a barn or storage, and the first floor dedicated to

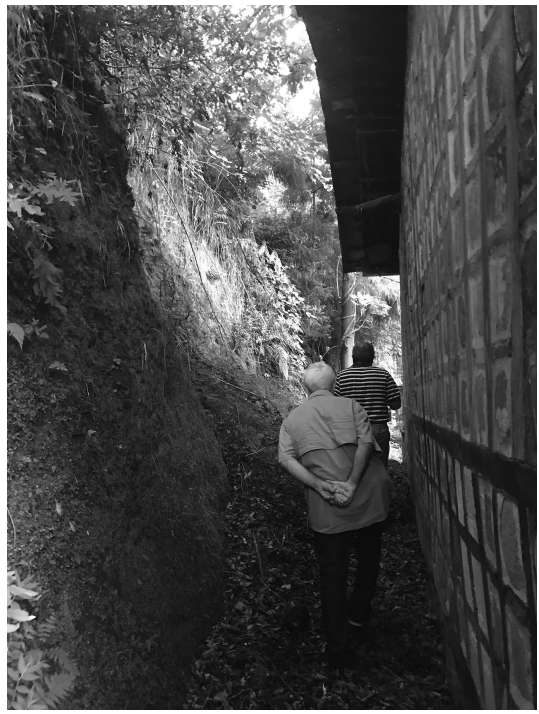

Figure 3.1 The narrow walking path between the rear façade of the vernacular houses and the sloppy hills makes it difficult for two people side by side at a time. Photograph by the author.

living space. In some cases, the building is partially under the slope of the land that covers half of the surface of the upper floor. In this situation, the thickness of the stone facing the side of the inclined terrain reaches over 100 cm thickness to bear the weight of the soil (Sümerkan, 2008). Utilizing the natural slope of the site, from the rear façade facing the slope, the building looks one-floored, whereas the front façade has two floors. Planning wide walking paths is not possible in hilly terrains where landslides form risks to local people. Thus, in some cases, between the building and the slope leading to hilly terrain, there is a narrow walking path for one or a maximum of two people to pass (Figure 3.1). The lack of flat land and the irregular forms of topography in the area create challenges but also provide opportunities for creativity.

These vernacular buildings are often located in the high-end (Ozen & Keles, 2008) or mid-section of the lot, along with a storage house next to it. Because the strong winds blow over the crest of the valley, the buildings located at the top of the lot may decay faster. This design is also for the benefit of local people who utilize the steep terrain to control and manage their livelihoods and farmland lying in front of their buildings (Bayram, 2014).

The inclination of the land caused the formation of a certain prototype in the region. Stone walls that are 50–60 cm thick are used in the construction of the foundation and basement floors, which are mostly used as storage or as a barn serving as thermal insulation. The selection of stone as a construction material in the foundation and basement is to protect the living rooms on the upper floor from minor landslides (Küçükerman, 1970). It is also to break the relationship between the humid soil and the timber walls on the upper floor (Sümerkan, 2008). The steep topography allows houses facing the north to view the forestry landscape (Eruzun, 1989).

The vernacular settlements are located on the southern side of the rivers, where the land is flatter than on the northern side and has sufficient solar exposure throughout the day. During site selection, flood-prone areas, shaded areas, and exposure to the cold north winds are avoided (Zorlu & Faiz, 2012). The valley plains in close proximity to rivers expose the settlements to floods, which are also not desirable for construction sites (Ozen & Keles, 2008). Minimum exposure to prevailing winds that carry precipitation and maximum solar exposure is achieved through the small clustering of the settlements. Local people plant trees in front of the building façades to protect the houses against damaging winds and precipitation. Thoughtful fenestration, openings, and overhang placement in vernacular houses allow for natural ventilation. These planning and design strategies customized to the local climate, along with specific construction materials and techniques, contributed to the creation of the vernacular heritage sites we see today.

The construction types differ according to their external façade systems, filling, and frame warping (Güler & Bilge, 2014). These construction systems are divided into three: (1) wooden masonry, (2) timber frame, and (3) combined construction systems (Sümerkan, 1989), as explained in Table 3.1.

Timber frame systems expand into three styles with wooden infilling, cell infilling, amulet filling, and *cakatura* (Güler & Bilge, 2014). In Anatolia, the timber-framed walls with infillings are known as *hımış*, though this term is not used in the region itself (Sümerkan, 2008).

The wooden infilling system is mostly seen on the mountain plateaus (Figure 3.3), and will not be taken into consideration because these structures are simply designed for a temporary stay in times of summer pasture activities. These structures are easily disassembled and are able to be reconstructed in another place due to the use of wooden joints, instead of nails (Sözen & Eruzun, 1992). The fact that all the interior and exterior walls must be constructed at the same time makes it difficult to make changes to the building or design plans once construction has begun (Batur, 2005). Therefore, this system is mostly utilized in simple vernacular houses in the villages with one or two rooms.

Unlike the timber masonry system, the necessity of building the internal and external walls together is eliminated with wooden infilling. Timber posts are placed at the two corners of the door and window openings, at the partition walls, and at the gap between the ceiling and basement joints. These pieces are then fixed together with wooden nails.

Table 3.1 Façade construction systems as they are called in the local dialect and materials used depending on characteristics of the area

S no.	*Façade Construction System*	*Translated*	*Materials Used*	*Areas Where It Is Used*	*Characteristics*
1	Wooden masonry	*Ahşap yığma*	Timber	Mountain plateaus	Timber used in masonry walls is placed on the stone masonry foundations extending about 20–30 cm from the joint points (Figure 3.2). Different joint systems on the corners, e.g., notched and neck joints, are used in this type of construction (Güler & Bilge, 2014). Interior and exterior walls are bonded and built together (Özgüner, 1970).
1a	Log staking	*Kütük yığma*	Timber		Logs are horizontally stacked, extending and overlapping at the corners. These stacked logs act as load-bearing elements. Vertical rods are not used on the edges of openings.
1b	Timber masonry	*Yontma yığma*	Timber		Walls also have the function of being load-bearing elements (Figure 3.4). Vertical bearing elements, which support the building structure, are only used at door and window openings.
2	Timber frame	*Ahsap çatkı*	Timber		
2a	Wooden-infilling	*Ahşap dolma*	Timber		The wooden infilling system consists of 3–5 cm wide wooden elements, which are placed between horizontal and vertical timber elements located above the stone foundations (Güler & Bilge, 2014). This is usually common in internal partition walls. Infilling elements are fixed to each other with wooden nails. When stone was added to this timber frame construction system, the last two types of construction emerged.
2b	Cell-infilling	*Göz dolma*	Stone infilled timber	East of the city of Rize	Built with rectangular stones and vertically filled in timber frames. The spaces between the stones and timber are plastered.
2c	Amulet-infilling	*Muskalı dolma*	Stone infilled timber		Built with triangular-shaped timber frames filled with small stone pieces and mortar.
2d	Çakatura	*Bağdadi*	Stone infilled timber, plaster	Coast of the city of Rize	Built with the plastering of the wall with mud and stone.
3	Mixed or composite	*Karma*	Stone, stone infilled timber, plaster		Built with two or more of these construction systems

Figure 3.2 Wooden masonry (yontma yığma) construction system used in Meyvalı mosque in Fındıklı. Photograph by the author.

Figure 3.3 Wooden infilling construction system used in the vernacular houses in Çamlıhemşin. Photograph by the author.

Cell infilling, which is also known as stone-infilled timber frame construction, is a method that uses stone and timber (Figure 3.4). This type of construction is more prominent in the coastal cities of the region, particularly in the eastern part of Rize. With overexploitation of timber from local forests, the timber buildings were replaced using a stone-infilled timber-framed construction technique, which is known as *göz dolma* in the local dialect (Eruzun, 1997). This modular system dates back 150–200 years.

Amulet filling, a timber-framed construction technique, utilizes triangular-shaped timber frames filled with small stone pieces and mortar. Locally known as *muskalı dolma*, this technique is identifiable from the lack of infilling, which may result from the loss of the filling material over time (Bayram, 2014). *Çakatura,* also known as *bagdadı,* is the plastering of the wall with mud and stone, a technique that is vulnerable to deterioration, as seen under the peeled plaster (Figure 3.5). This type of construction is usually used in combined techniques and therefore, it is rare in the region (Figure 3.5). In addition, buildings with two or more construction systems can be found that employ mixed or composite construction systems (Güler & Bilge, 2014).
The distance between the city center of Rize and its surrounding villages varies from 2 to 30 km, which explains the distinction in architectural styles of the urban and rural built heritage. Even the city center itself is approximately 200 m inland from the sea (Leloglu, 1987). Far from the hinterland, the construction techniques that are used for the coastal mansions are not very common in rural houses. Coastal buildings were called *yalı*, which defines

Figure 3.4 Cell-infilling is quite common in Fındıklı. Photograph by the author.

Figure 3.5 Combined construction system, including stone, stone-infilled timber, and *çakatura* on the top floor. Photograph by the author.

the two or three-floored waterfront houses. In the construction of coastal mansions, the eye-filling method was prevalent but this method was later replaced with a triangular infilling system also known as *muska dolma,* and a plastered timber frame system called *çakatura* technique was used in the Eastern Black Sea region (Eruzun, 1997). The chestnut tree is used in the construction of coastal buildings while in the hinterland the use of pine trees was more common (Eruzun, 1997). In addition, in the construction of coastal buildings, less available trees such as walnut, oak, and elm were used as construction material (Fidan et al., 2016) which could only be afforded to be sourced by wealthier clients.

For the construction of the roof and chimneys of coastal buildings, brick, roof tiles, and terracotta were used (Eruzun, 1997). The roof is constructed in a way to drain the rainwater. In the hinterland, a thin timber plate known as *hartama* was used as a roof cover, whereas pantile roofing is preferred in coastal buildings (Eruzun, 1997). It is acquired by axing spruce trees thinly. *Kara saçak* is used to describe when there is no timber-covered overhang under the roof construction whereas *debren* refers to the timber overhang (Leloglu, 1987). *Kara saçak* is observed in the hinterland, whereas *debren* is prevalent on the shoreline (Leloglu, 1987). However, the difference between

the two may have to do with the protection of the building against strong winds and heavy rain as the shoreline buildings were more prone to these natural elements.

Lay people, unlike the architects of grand monuments, constructed these buildings with materials available in their direct surroundings, using techniques that were passed down from previous generations. These techniques were replicated across the region with slight differences depending on personal and local needs, customs, and preferences. Due to the slow economic development in the hinterland, the rural cultural heritage remained untouched until the 1950s. As people returned from the cities of Istanbul, Ankara, and other major cities to their homeland in Fındıklı in Rize, the rural built heritage was replicated in the construction of new buildings. These village houses became fashionable again with the sustainability movement in the early 21st century when younger generations returned to their hometowns to continue traditional agricultural practices alongside modern sustainable practices. It is their interpretation of their cultural heritage that reveals the generational difference in the value and management of vernacular settlements. Their parents adopted recent building materials and techniques and denied the intricate value of these vernacular buildings. The youth left their hometowns for opportunities in major cities only to return later to enjoy the rural lifestyle.

These vernacular settlements in Fındıklı, as will be further elaborated on later in relation to local climate (see Chapter 4) with various examples, began to become extinct. While the influence of rural depopulation (see Chapter 6) is undeniable in the context of heritage loss, disasters in recent years, exacerbated by spatial planning decisions and practices, have sped up this heritage loss process.

3.6 The Setting: Geography, Climate, Topography, and Socio-Economic Structure of Comparative Cases

While the case of Fındıklı in Rize offers a localized, in-depth exploration grounded in community interviews, spatial mapping, and archival research, this section introduces comparative cases from different geographical and methodological contexts. These examples provide critical contrast and complementarity, enriching the overall understanding of how vernacular heritage is impacted by climate change under diverse conditions.

3.6.1 Leh-Ladakh

Leh is a city of Indian-administered Ladakh in the disputed Kashmir region, the northernmost geographical region of the Indian subcontinent. Ladakh is bordered by the Tibet Autonomous Region on the east, the Indian state of Himachal Pradesh on the south, and Pakistan's Gilgit-Baltistan and Siachen Glacier on the west. Isolated by the Himalayan Mountains, Leh covers an area of 9.15 km^2 and is located on the Indus River bank (Dolma et al., 2020).

Ladakh's climate is largely influenced by the mountainous ranges that lie within its territory. Leh has a typical cold desert climate, characterized by long, freezing winters from late November to early March (Nasir & Arif Kamal, 2021). While snowfall is common in the winter, overall precipitation remains low with annual precipitation of about 100 mm, resulting in cold and arid climate conditions (Soheb et al., 2024). In contrast, the summer months bring relatively warmer weather and increased temperature (Singh & Bhatla, 2024) resulting in increased runoff or melting of glaciers because of Himalayan monsoon (Sharma & Phartiyal, 2020).

Snow melting in the summer and increasing precipitation lead to flash floods and landslides, leading to disasters in the area (Nagamani et al., 2024). Compatible with the harsh climatic conditions, lives of local people have adapted to the rugged steep terrains around the riverside villages. Compared to the waterways where natural vegetation is plentiful, there is limited and sparse vegetation in these high altitudes, mainly due to the lack of precipitation. Lack of fertile land led local people to generate income from livestock and agricultural growing (Dame & Nüsser, 2011). Primary crops include barley, grapes, apricots, currants, walnuts, and apples (Stobdan, 2023).

As of 2025, the estimated population of Leh Ladakh Municipal Committee is approximately 44,000, more than half of the population (65.79 percent) living in the rural areas (Census 2011, n.d.). Due to the significant presence of transient laborers, traders, and government employees, Leh has a skewed gender ratio, with males comprising a larger share of the population. According to the 2011 Census, the sex ratio in Leh district was approximately 690 females per 1,000 males, one of the lowest in India (Census 2011, n.d.). Leh had an average literacy rate of 77.2 percent, which is higher than the national average of 74.04 percent (Census 2011, n.d.).

The inhabitants of Leh are primarily ethnic Tibetans who speak Ladakhi, a Tibetic language (Wilson-Smith, 2015). Surrounded by numerous monasteries, Buddhism is the dominant religion in the region, followed by Hinduism and Islam (Coelho, 2024).

3.6.2 Miyama

Miyama is a rural town in Miyama-cho Kita, Nantan city of Kyoto Prefecture in Japan. Located in the middle of Kyoto Prefecture, covers a 340 km^2 area, approximately 90 percent consisting of forests, making it naturally and culturally preserved landscape (Doshita, 2010).

Miyama is characterized by its mountainous terrain, villages, and valleys. The Yura River, originating from Ashiu virgin forest at the east end of the region, flows through Miyama from east to west, ending up Japanese Sea (Doshita, 2009). Close to its banks, linear vernacular settlements lie.

The area's isolated geography, once accessible only by narrow passes through surrounding mountains until tunnels were built in the early 20th century, has helped preserve its historical character.

Miyama has a humid subtropical climate (Köppen Cfa), with cooler temperatures than urban Kyoto, often 2–3°C lower, especially in mornings and evenings (Kyoto Miyama Tourism Association, n.d.). The average annual precipitation is about 1,509 mm, with snowfall common during the winter months. In December, the region typically experiences average highs of 11°C and lows of 3°C, contributing to the winter landscape that defines its architectural form (Kyoto Miyama Tourism Association, n.d.).

The region supports an exceptional diversity of plant species, with around 240 species of woody plants, over 530 species of herbaceous plants, and 85 species of ferns recorded (Kyoto University, 2020). This biodiversity reflects the area's transitional position between the Pacific Ocean and Sea of Japan climatic zones.

Local people engage with agriculture, forestry, and paid employment (Doshita, 2010). In 1995, about 900 households owned small-scale private plots of paddy fields with most units being less than 100 m^2, and more than 1,000 households owned private woodlands, the average area of which was also small, less than 500 m^2 (Doshita, 2010).

Some of the local agricultural products include rice, fresh vegetables and fruits, green tea leaves (Doshita, 2010). Miyama is also notable for the coexistence of Shinto shrines and Buddhist temples, which are deeply integrated into the daily lives of its residents (Kyoto Miyama Tourism Association, n.d.). The community exhibits a strong sense of self-sufficiency and communal living.

3.6.3 Dogon

Dogon Country, a region of eastern Mali and northwestern Burkina Faso, is populated mainly by the Dogon people, a diverse ethnic group in West Africa with diverse languages. Starting from the Niger River in a south-eastern direction, toward Burkina Faso, Dogon country has three distinctive types of landscapes: plateau, cliff, and plain. The entire region, including the escarpment, plateau, and plain, covers approximately 400,000 hectares and encompasses 289 villages (UNESCO, n.d.).

Dogon Plateau is characterized by a vast sandstone plateau rising gradually from the river to the cliff, which faces Burkina Faso. The cliff, known as the Bandiagara Escarpment, is nearly vertical with heights between 100 and 400 m, overlooking the Seno plain (Rak & Mynarski, 2016). The escarpment stretches about 200 km from Ségué in the south to Douentza in the north, with altitude increasing toward the north, reaching 791 m near Bamba, Koro (Rak & Mynarski, 2016). At the foot of the cliff lies the Séno-Gondo plain, extending to the Burkinabé border (Rak & Mynarski, 2016).

The Dogon Country in Mali experiences Southern Sahelian zone climate, characterized by high temperatures and seasonal rainfall fluctuations, with 800–1,100 mm of rainfall over 125–150 days of the year (Global Facility for Disaster Reduction and Recovery et al., 2011). The Malian climate is characterized by three seasons: a dry season from March to June, a rainy or

wintering season from June to September, and an off-season or cold season from October to February with a drying Saharan wind called the harmattan (Climate Change Knowledge Portal, 2021). The average temperature varies between 24°C in January and 35°C in May (Climate Change Knowledge Portal, 2021).

The Dogon people, an ethnic group indigenous to the central plateau region of Mali, number between 400,000 and 800,000 individuals. They primarily reside in the Bandiagara and Douentza districts of Mali, with some communities extending into neighboring Burkina Faso.

The Dogon economy is primarily based on subsistence agriculture. Farmers cultivate crops like millet, sorghum, and onions, often relying on traditional conservation techniques to manage soil fertility (Douny, 2018). Onions are the most commonly cultivated crops, followed by tomatoes, sweet potatoes, tobacco, and peppers (Kassogue et al., 1990). In addition to farming, the Dogon engage in animal husbandry, raising goats, sheep, and chickens (Mellott, 1984).

Trade is another vital component of the Dogon economy. Villagers participate in regional markets, exchanging agricultural products and crafts for goods like salt, cloth, and tools (van der Loeff, 2005). These markets also serve as social hubs, fostering interactions with neighboring ethnic groups.

Religious beliefs are deeply integrated into daily life. The Dogon have diverse range of religious beliefs, including practice of animism that emphasizes harmony between the spiritual and physical worlds, Islam and Christianity (Eller, 2007). Traditional Dogon Religion, which center around a supreme creator god named Amma and ancestral spirits known as the Nommo, is the most prevalent religious belief (Eller, 2007). Their religious practices include elaborate rituals, mask dances, and ceremonies such as the *sigui* festivals with various rituals, which occurs every 60 years (Bedaux et al., 1991).

3.7 Conclusion

This chapter has shown the role of local conditions in depicting the common construction techniques and details used in the construction of vernacular settlements from the examples of Fındıklı, with references to the city and regional variations to different typologies, and the local context of comparative cases. It describes the existence of different typologies but among all these, how one type of construction system became most commonly seen in the hinterland of Fındıklı. By understanding these different construction materials, methods, and techniques, this chapter gives insights into the distinctive features of the vernacular landscapes of the chosen case study area of Fındıklı. These houses that were built, rebuilt, reused, expanded, divided, transformed, and adapted to satisfy the needs of the residents give important lessons in climate-resilient design features. It reveals the reason why coastal heritage has been lost due to development while mansions, which were once constructed by trades people, were abandoned in other districts of

the city. Nonetheless, the local people maintained their lifestyles along with their settlements in the hinterland of Fındıklı. While some of the regional and urban characteristics present similarities with rural vernacular architecture in Fındıklı, certain aspects of vernacular buildings in the district (e.g., stone-infilled construction system and small-scale village houses) diversify from the rest of the city.

Note

1 There are very few historical encounters on the formerly small coastal town of Fındıklı and Rize which derive mostly from geographical surveys and traveller observations.

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4 Pre-industrial Vernacular Landscapes and Climate Responsiveness in Rize (1800–1923) and Reflections from Comparative Cases

4.1 Climate as a Shaping Force: Vernacular Landscapes of Pre-industrial Fındıklı

The local weather conditions of the city differ distinctively from the hinterland. Installations of meteorological stations in these areas were completed in different periods, stations in the hinterland are the most recent. Therefore, the meteorological data is available only more recently, and historical data on weather conditions for cities like Rize is quite limited.

Despite the difficulties in reconstructing the climatic conditions behind the creation of vernacular landscapes in the past, it is still possible to deduce historical climate-culture interactions from the reading of these landscapes. Adaptation to local climate is visible today in the site selection, orientation, and planning of the historic vernacular buildings, as well as in the selection of materials and techniques, structuring, and interior furnishings. There is not much known about how these decisions are made. The knowledge of local people and their perceived behavior of the environment helped them to craft locally appropriate adaptation strategies. Their careful selection of the site for the construction, lot configuration and layout, and consideration of resistant materials in response to the local climate better represented their needs and climate-sensitive planning.

Given the 250 years of history contributing to these building techniques, traditional knowledge proved to be valuable in many ways. One such way is the reusing of materials to rebuild after a disaster strikes. For instance, following damage from a fire, local people in Çağlayan village in Fındıklı sorted fire-damaged timber by classifying it according to the degree of the damage, setting aside what could be salvaged for later reuse. After the removal of damaged or decayed materials, community members reused the old timber, which is still durable, in the construction of the next building. Interior design elements, such as the ceiling roses, were also reused in the newly built vernacular houses. These circular construction methods and planning practices revealed how local people in the past preserved the typical vernacular buildings in the region.

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4.1.1 Spatial Organization, Orientation, and Configuration

In addition to the Black Sea's effect on relative humidity, the high precipitation and extreme rainfalls of the Fındıklı region increase atmospheric and soil moisture. The shoreline of the Fındıklı district was a hostile environment in which to settle. Frequent storms and flooding followed by heavy rains had severe impacts on coastal properties. These coastal areas were formerly swamps where mosquitoes brought diseases like malaria, as stated by Y.Y., the project manager for the European Union-funded project "Training Masters for Rural Built Heritage in the Eastern Black Sea Region" (Y.Y. Çağlayan). Though less common, piracy due to the marine trade was nonetheless another factor influencing the preference for settlement in the hinterland rather than along the coast (Eruzun, 1997). However, problems with piracy and harsh local climatic conditions did not prevent most of the fisher people from constructing coastal settlements, which are defined by small shops on the ground level of three-story houses at different elevations rising from the shoreline.

Referring to the 1600s, a building owner, Y.G. agreed:

> "Back then, Fındıklı was a swamp. In other words, no one would have settled in the city centre due to the mosquitoes and swamps...Then there was a domestic hostility. Our Suleyman grandfather took their grandfather [referring to the family of Şevketbeyoğulları] with him and came here [to the Çağlayan village]. They built their home there" [pointing to the field across from the current building].
>
> (Çağlayan, July 5, 2019)

There are many rural mansions like the one belonging to the aforementioned family in the hinterland. This is especially prevalent in the lowlands, where landowners frequently own a large property, including arable land that includes primary buildings and additional units such as a barn, storage house, kiln, water-well, and other houses. The architectural detailing of the buildings, as well as the amount and extent of ornamentation indicate the wealth and socio-economic status of the landowner. These vernacular sites with grandiose mansions demanded more care and maintenance than other local properties. Therefore, these estates required temporary/seasonal farmland workers called *yarıcı,* who came from the western cities of Giresun and Ordu, to help maintain the property, including the building, storage houses, and *bageni.* Five out of 25 seasonal workers were local people and the remaining 20 were farmland workers, as mentioned by a local truck driver who wished to remain anonymous. Homeowners hired *yarıcı* to harvest the tea crops and manage the land in their absence as some of the homeowners reside in their houses in the hinterland only temporarily. *Yarıcı* was and still is paid by being given a share of the harvested tea. In the past, seasonal workers would stay with their families that came with them in the larger

mansions, along with the landowners. However, with the migration from the nearby cities, the mutual trust between the *yarıcı* and the homeowner has changed. And today, there are separate residences for the seasonal workers and their families, which are not constructed in compatible with the architectural style of vernacular settlements. Historically, these seasonal workers stayed in the main houses on the estate property along with their families.

On small landholdings, it was common to see corn plantations and animals feeding on the corn cobs before these fields were converted to tea production, as pointed out by an older local resident (C.K. Hara, July 3, 2019). At one time, corn plantations comprised more than 90 percent of land use; however, the production of corn later became inadequate and could not meet the demands of the local residents (Arslantürk, 1986). The excessive rainfalls damaging the leaves of corn crops could be one of the reasons for the local shift to tea crops (Zaman & Cerrah, 2013).

The growing population since the 1950s in villages led to further fragmentation of already small properties (Arslantürk, 1986). These corn fields turned to tea fields lay in front of the dwellings that are located on the highest point of the steep terrain. In order to protect their lands from theft, the villagers preferred to sleep near their arable lands to defend their crops of corn, hazelnuts, and tea (Sümerkan, 1989). In addition to promoting security, this arrangement provided better control of the homeowners over their lands and farmers to organize their seasonal work in the field. Furthermore, additional structures, such as storage houses, were constructed around the main building to allow for space to reap, lay, dry, store, and process the cultivated crops of tea, fruits, and corn (Usta et al., 2012). Keeping the food sources away from humidity was, therefore, significant. This was achieved by considerably elevating the storage house above the ground. The space beneath the storage houses became a shady gathering point offering respite for local community on hot summer days.

The scattered settlements were built in areas suitable for farming and building construction (Sümerkan, 2008). These locations were easily accessible, close to water sources, protected against winds and landslides, and had a view of the natural landscape (Sümerkan, 2008). C.K. observed that, "here the houses are distant, but now they are building the house below the field of corn" (C.K. Hara, July 3, 2019). According to his statement, which was repeated by Ş.S., "In the past, the mansions were built above the cornfield so that the rainwater carried the scat of animals down to the slope and fertilized the land" (Ş.S. Fındıklı coast, personal communication, January 14, 2019).

In this way, local builders designed structures carefully to use the excess water from rainfalls for their benefit. They located their houses on the higher end of the slopes to control not only their property but also the water flow on their lands. A sloped environment for rainfall and drainage is necessary to carry surface water away for hygiene, as standing water could attract mosquitoes. Local communities set up an irrigation system to divert water through wooden channels to their gardens and houses. Similarly, they dug canals—locally known as "hark" or "ark"—to channel the rainwater away

from the building to the farm fields or the toilet pits. The channeling of water by local people in the past was according to their needs, but public institutions today do not consider these local practices in the management of water resources. This leads to conflicts between the local communities and public institutions. The availability of water is also becoming more of a concern with the expected drought in the country. Therefore, the implications of the past management of water in understanding climate-resilient communities matter greatly.

The type of spatial layout and orientation of the settlements are also suitable for the collective but respectful living of the local communities. Distanced from the river, these buildings are located on a lowland and oriented in different directions so as not to impede the neighbors' view. Each building has a storage building and loft. Both entrances in opposite directions of buildings are facing east-west, while buildings are facing north-south direction (Figure 4.1). A local administrator, who wished to remain anonymous, explained the reason behind this decision:

> The settlements are distant from each other due to the privacy aspects. One person's yard, which is built slightly higher than his or her neighbours, rarely faces the neighbouring property.
>
> (Fındıklı, January 11, 2019)

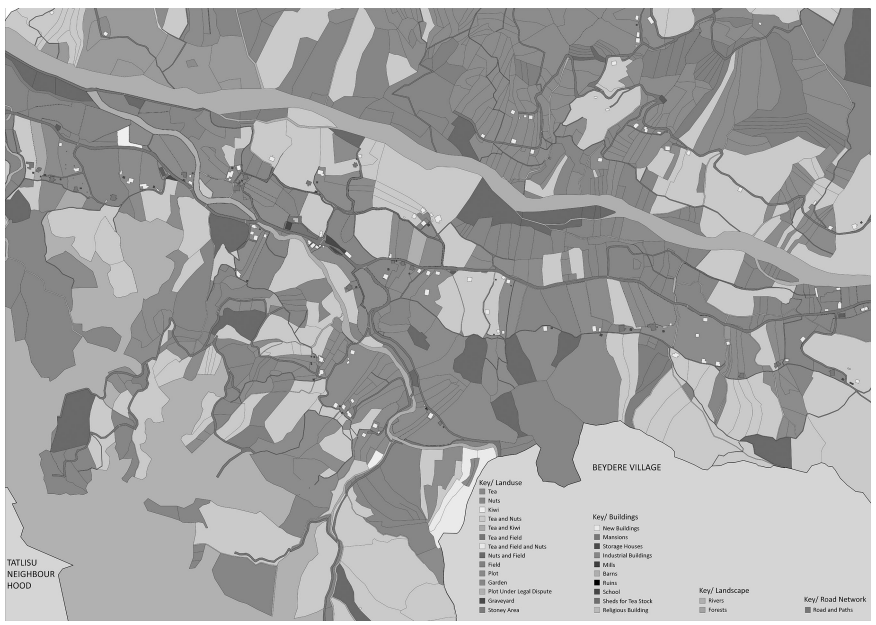

Figure 4.1 The plan of the lowland settlements located in Çağlayan village showing typical vernacular houses, storage houses, haystack houses, and water mills. Map was created by the author in January 2019 (Aktürk, 2019).

The local residents some 250 years ago used to follow customs in alignment with the climate when determining the building lot placement, according to a folk story. The local administrator also mentioned, "In the past, on the rocks, local people determine the location of Ocak, which means cooker, but it is a local term to describe the *home*" (Local administrator, Fındıklı, personal communication, January 11, 2019). He further explained the decisions of local communities behind the location of their houses (Local administrator, Fındıklı, personal communication, January 11, 2019):

> The place of the cooker in the living room is thus called home. Before construction, they sacrificed an animal (usually a cow) and pieces of the meat were hung on defined spots. If the meat is not rotten after waiting for three months, this location was selected for the construction of the house. By doing so, the rotten part of the meat signaled that the area received humidity, which could deteriorate the timber.

This ingenious method is also derived from the religious and mythical customs in constructing a site. Sacrificing livestock before constructing a building was and still is a practice in constructing buildings. Its use in understanding the direction of the wind and precipitation is genius. Above all the determinants, the local artisans did not construct the buildings along the river valleys to avoid the prevalent winds and floods. In the past, the settlements were built in places where the economic value that land and building could bring[1] were not the main concern, according to an interview with a local truck driver on a Fındıklı construction site (Fındıklı İl Özel İdaresi) (Local truck driver, Fındıklı, personal communication, January 11, 2019). Y.Y. further elaborated on the flood-resilience of these mansions in the valleys of Sümer and Arılı:

> Approximately over 100 buildings are protected. These houses were not built in random places. They have a culture and past experiences. The places where the houses were built would not be affected by disasters like floods. Since the structures here are exposed to humidity, it is this thing that caused their [referring to the vernacular buildings] decay.
>
> (Çağlayan, January 11, 2019)

The configuration of hills, valleys, and slope orientation influences relative humidity, while the positioning and orientation of vernacular sites are with respect to the sun and wind. Thus, the decisions behind the design of vernacular landscapes were not merely arbitrary. The design was informed and anchored by the local knowledge of the climatic conditions, notably precipitation, of the area at the time. This knowledge is also reflected in the building design decisions, including the construction systems, facades, material choice, flooring, openings, roofs, and partition of the rooms. This localized knowledge of climate-adaptive solutions and strategies can be heard, if one listens closely, in oral statements

from local people. It is not, however, widely accessible outside the district. The literature on the vernacular buildings rarely highlights evidence behind the passive design. Moreover, the translation and utilization of this knowledge in construction and planning practices are often missing. Today, even climate change policies emphasize harnessing the traditional ecological knowledge of local communities for building climate-resilient cities. Inspired by the local knowledge of the planning of the vernacular settlements, urban and rural planners, design professionals, and constructors should make full use of it to effectively integrate nature into the construction of contemporary settlements.

4.1.2 Building Facades

In considering the relationship between climate and building design, a former Professor of Architecture at Karadeniz Technical University stated that, "the foggy, rainy weather with a short period of sunlight affected the decisions of the positioning and size of the openings, the height of ceilings in the building as well as harvesting time" (Anonymous, Rize, June 29, 2019). The local artisans constructed these buildings in great harmony with the activities of the building occupants (Karahan & Davardoust, 2020). He further highlighted:

> The entrances of the historical structures in Çağlayan village are facing south, east, or southeast as the homeowner wakes up for daily routines such as working in the farm field together with the first rays of the sun.
>
> (Sümerkan, 2008)

In a personal correspondence, C.K. revealed the harsh conditions of agricultural practices concerning climate due to lack of sunshine and radiance, resulting in the local communities having difficulties growing vegetables and fruits depending on the season (Hara, personal communication, July 3, 2019). In Rize, the highest amount of sunlight is in June. Due to this brief period, solar gains in June are critical for the successful growing of crops. In this sense, C.K.'s statement that, "the soil is fertile but there is no abundance of sunshine" (Hara, personal communication, July 3, 2019) supports the adaptation and design of the vernacular structure such that crop fields are located in areas where the sun is most intense. In discussing the relation between the local climate and crops, as Y.G. shared that, "In the past, the rain was more excessive, but there is still rain; otherwise, the tea crops would not grow" (Çağlayan, personal communication, July 5, 2019). Supporting this statement, B.U. further emphasized:

> There was no snow last year. It used to snow on the hills. It was sunny 20 days in the summer, but now the snow has decreased. They [the past residents] did not water the garden in the past. Now, they are constantly watering their gardens. It always rained.
>
> (Çağlayan, personal communication, January 10, 2019)

North and northwest winds bring precipitation, whereas south and southwest winds carry cold, especially in the winter (Engin et al., 2007). As such, the positioning of the entrances of the buildings minimized exposure to the effects of prevailing winds from north and northwest directions (Engin et al., 2007). To protect the building and its entrances against the winds, it is surrounded by deciduous trees (Engin et al., 2007). The dual entry from opposite directions allows for separate access for the inhabitants and the guests. Hospitality and respect toward guests, as are important to the culture, are deeply rooted in the exterior and interior design of the building. Before entering the house, presenting themselves to the household and greeting guests, the homeowner washes their hands and their face after a long day of work in the farmland by using the toilet in the entrance on the opposite side of the main entrance or by using the small fountain located outside.

Alongside the positioning of the entrances, building materials and techniques also relied on an understanding of the local climate. The walls of the vernacular houses were traditionally of stone, which was collected from the nearby rivers, and timber, which was abundant in the nearby forests. This typical construction is known as the stone-, eye-, cell-filling method. Walls facing the prevailing winds were constructed with stone or chestnut as "it is resistant to moisture" (H.Ş. Çağlayan, personal communication, June 30, 2019). Emphasizing its resilience, Y.Y. detailed that "the chestnut timber is most commonly used as the decay cause of the structures is mainly due to humidity and precipitation" (Y.Y. Çağlayan, personal communication, January 11, 2019). Timber was abundant in this area until the widespread deforestation of the forests. Thus, the cell-filling construction method emerged as the overuse of timber in construction, furnishing, and trade made this resource more scarcely available. To illustrate this point, C.K. explained:

> Chestnut is a long-lasting timber. The chestnut tree used in home construction has a long life span. It lives 500 years. No other tree type was used to construct a house outside of that tree. When the chestnut tree became less available, this type of building technique [stone-infilled timber construction] became prevalent. It came out of the needs of the local communities.
>
> (C.K. Hara, personal communication, July 3, 2019)

The local laypeople ended up constructing these buildings with the stone-filling method and wooden framework because of the rarefaction of wooden materials. Firstly, they collected grey and blue-colored granite stones from the nearby streams, which were then cut into 17 × 22 cm rectangles. Laypeople then carried the long timber logs and stones to the steep slopes. H.Ş. mentioned that "the stones in the size of 16–17 cm width and 22–24 [cm] height were cut and the back stones were filled in between chestnut timbers" (Çağlayan, personal communication, June 30, 2019). Workers subsequently

laid these stones within the timber frames and plastered the spaces between the stones and timber frames with clay to ensure thermal insulation. Giving an example from his house, C.K. said that "the interior of the stone-infilled timber is always covered with timber" (C.K., personal communication, July 3, 2019).

The ground floor of a vernacular home was constructed of stone to endure the humidity of the soil, while the upper floor was constructed with timber and was lower in height (Engin et al., 2007) to differentiate the functions of the two floors based on materials used in the façade: living areas on the ground floor and private rooms upstairs. The construction material of the façade was chosen according to the direction it faces. When there are no options for flat land available, it is often the case that the buildings are constructed adjacent to sloped land. For instance, if the building was facing a steep slope on the rear side, it was built with stone to endure the weight of the soil. Near the slope, approximately one meter away, the solid stone façade could prevent any potential damage that might arise from a landslide. In steeply sloped areas, the ground floor of the houses is partially buried under the hills. Conversely, lowland houses are partially elevated with a stone foundation.

Unlike in desert climate regions, the buildings in this area did not have terraces, nor inner or outer courts, as it would expose the building to extreme humidity and precipitation and cause heat loss. In addition, the south and east sides have larger windows to take advantage of the direct sunlight, while there are fewer and smaller windows facing cold north and northwest winds (Engin et al., 2007). There are some buildings that have windows facing these directions with wooden shutters that can be shut to keep the cold and wind from entering the houses (Engin et al., 2007).

The wooden shutters help to reduce heat loss at night while still allowing sunlight during daylight hours and providing cooling airflow in the summer. These shutters are fitted externally, which is why they are prone to weathering, especially in cases where the buildings have narrow roof overhangs that allow for water penetration carried by strong winds. When closed, these shutters also provide security. In the living rooms, large windows provide a view of the forested and tea landscapes. In rare examples, one or two *cumba(s)* (bay windows), often placed in living rooms, allow for natural light. Long and narrow windows, however, do not provide much warmth and light inside, resulting in dark interior spaces that can appear darker due to the deep chestnut timber furnishings.

Woodworking in the past required a great deal of effort, from the process of collection to shaping and carving into the final product. Before the introduction of sawmills in the area, it was especially difficult to cut up the timber harvested from the 10-meter-tall trees. From constructing homes to cooking, all domestic activities involved the collaboration of neighbors at every stage. The difficulty of the entire process was outlined by one of the house owners, T.H., who recalled the sound of the mason's adzes,an ancient cutting tool similar to an axe, saying

that "everything was made by hand" (T.H., Gürsu, personal communication, July 2, 2019). Having no workshops or sawmills made for long and difficult labor involved in the processes of ornamentation, carving, and shaping timber. Unlike modern carpentry practices, "the trees were cut and grated" (T.H., Gürsu, personal communication, July 2, 2019) by hand and with handmade devices. Apprenticed to his father, a local stonemason, Ş.S., said:

> Generally, most of the stones used in these houses were brought from the Çağlayan river. We used those stones, which come rolling down from the Kackar mountains…There are granite deposits…The stones roll down naturally.
>
> (Fındıklı coast, personal communication, January 14, 2019)

From obtaining the material to shaping and carving it, the artisans worked at every stage of the construction of these settlements. Concerning traditional practices, Ş.S. observed that in the construction of the cell-infilled houses, the stones were laid in the timber frame set back by 1 cm (Fındıklı coast, personal communication, January 14, 2019). This was to allow for the stone to fit by leaving the remaining 1 cm for the plaster. The uneven side of the stone was then covered with timber or plaster. Stone and timber mason A.S., who started work at the age of 13, described the process of 'forming' the timber:

> I brought the trees from Murgul, Şavşat, and Hopa in Artvin in Türkiye then I cut them here in my workshop. For instance, we were using a long wood plane called a *küstere* to shape the wood. By using *yonma balta* (a chopper), timber was peeled or whittled…Then we checked whether both sides of the timber were of equal size or whether they had any bumps. After flattening them, we used an *ayak keser* (a device to cut logs) to drill a hole for the horizontal timber frame, because it cannot be opened with a woodworking *rende* or *planya* (both are types of plane).
>
> (Beydere, personal communication, January 11, 2019)

Y.Y., who was once a house owner himself, talked about the natural drying process of timber. As the grandson of a local craftsperson, he recollected that his grandfather "would cut the chestnut trees when they were dry after a while" (Çağlayan, personal communication, January 11, 2019). He explained that "if the dryness was starting from the bottom, once it was cut, it would grow again" (Çağlayan, personal communication, January 11, 2019). This method, also known as natural seasoning and wood drying, is the traditional method of exposing wood to the air to evaporate the excessive moisture to prevent damage (Forest Products Laboratory, 1999). Wood is air-dried or dried in a purpose-built oven (kiln) (Çağlayan, personal communication, January 11, 2019). Y.Y. explained that, by using this method, the chestnut trees could be

resurrected from their roots and reused in construction work (Çağlayan, personal communication, January 11, 2019). Today, legislation preventing trees from being cut (and then regrowing naturally) not only prevents people from harvesting this material, but also prevents the trees from dying off. Eventually, it has led chestnut tree trunks to become completely dried out in the forests. Even though it may be due to diseases, the tree that is cut sprouts again from the root.

Even the chestnut timber becomes a darker color over time due to high humidity and the smoke from coal-burning in the houses. Sometimes, the wood is painted. However, according to Y.G., one of the house owners in the district, "the black color on chestnut timber is a natural reaction of the wood to humidity" (Çağlayan, personal communication, July 5, 2019). Preserving the material against humidity requires natural drying. If not properly dried, timber, particularly chestnut, starts 'moving,' shrinking or swelling. To avoid this, carvers prefer to use a natural drying process. In an attempt to minimize the 'movement' of the timber, Ş.S. recommended the use of the *daraba* system (timber boarding or a partition), saying that, "we drill the massive timber with another type of timber on both sides" (Fındıklı coast, personal communication, January 14, 2019). According to Ş.S., the use of this traditional system does not leave any gaps or fluctuations between the joints. Today, however, the use of epoxy in filling the cracks and holes speeds up the process of timber degradation. Glue line delamination in glued pieces of timber as well as the limited durability of epoxy adhesives against temperature, humidity, and other determinants could potentially negatively affect the timber (Cruz & Machado, 2003). Evolved from the need of keeping the building dry, homeowners paid attention to the roof construction as much as they did to the building envelopes. The roofs of these buildings are designed to protect the exterior façades of the buildings against extreme precipitation and rainfalls while allowing for natural air circulation inside.

In Fındıklı, the local conditions influenced the entrances and facades of buildings. North and northwest winds bring precipitation, whereas south and southwest winds carry cold, especially in the winter (Engin et al., 2007). As such, the positioning of the entrances of the buildings minimized exposure to the effects of prevailing winds from north and northwest directions (Engin et al., 2007). To protect the building and its entrances against the winds, it is surrounded by deciduous trees (Engin et al., 2007). The entrances are pulled inside and protected against the elements (Engin et al., 2007). The dual entry from opposite directions allows for separate access for the inhabitants and the guests. Hospitality and respect toward guests, as are important to the culture, are deeply rooted in the exterior and interior design of the building. Before entering the house, presenting themselves to the household and greeting guests, the homeowner washes their hands and their face after a long day of work in the farmland by using the toilet in the entrance on the opposite side of the main entrance or by using the small fountain located outside.

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4.1.3 Roof

A large roof overhang extending approximately 150 cm, particularly in Çağlayan village, protects the façades from weathering by reducing exposure to the sun, snow, and particularly rain. The substantial space between the roof and the windows prevents water from permeating the building. The roofs were formed in an arched shape with extensive overhangs that allow rainwater to fall away from the facades (Bayram, 2014). To avoid snow melt and rainwater inundating the foundation of the houses on the hills, the slope

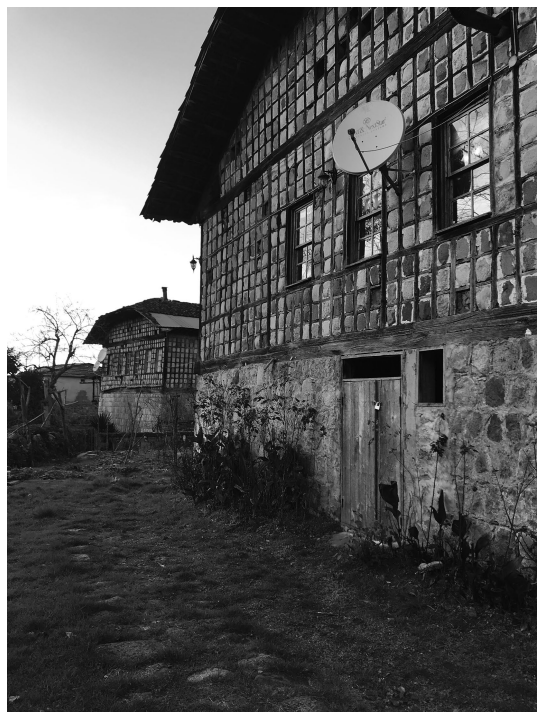

Figure 4.2 The low-pitched roof structure with extended roof overhangs is quite common in Çaglayan Village. Photograph by the author on January 12, 2019.

of the roof does not have a high incline (Bayram, 2014). Constructed almost entirely of wood with traditional tiles, low arched roofs, often with no ceilings, allows for high sunlight absorption and good air circulation. In roof construction, the four-ridged structure is preferable to the three-ridged roofs due to the former's resistance to wind and snow load. Although the roof structure in the area is not high-pitched, it is questionable how the current three to four-ridged low-pitched roof structure could carry the snow load (Figure 4.2). The explanation lies in the size of the timber beams that were strong enough to carry the snow weight. In support of this argument, H.Ş. mentioned:

> The roof structures here usually have a 4-ridge. The roof is supported by the poles and trusses to be able to carry the snow load. Unlike the high-pitched roof, the 3,4,5-ridged roof has a pleasant image.
>
> (Çağlayan, personal communication, June 30, 2019)

Roof structure carries the snow load and does not need to be constructed high pitched.

Alongside its aesthetic view, the roofs were rigid enough to stand up against the wind and snow load. Regarding its durability, T.H., the owner of a historic building in Gürsu Village, explained:

> Timber trusses hold the roof. In addition, there are timber beams that stand next to each other to hold the roof tiles. Poles under the trusses provide full support. I know with the help of the neighbour that we could clear the snow from the rooftops when the snow load was very heavy. The neighbours would step in the clearance of snow from the rooftop.
>
> (T.H., personal communication, July 2, 2019)

Dealing with such harsh climatic conditions reflected on collective neighborhood relations. H.Ş. pointed out that "1.5-2 meters high snow would cover the village and villagers would help each other out to shovel the snow off the roofs with the help of stairs" (Çağlayan, personal communication, June 30, 2019). F.H. agreed by saying that "I remember clearing the front of the doors from the snow with a help of buckets two years ago, at the funeral of my father" (Çağlayan, personal communication, January 12, 2019).

Accordingly, H.Ş. added, "The roof would make loud sounds due to the heaviness of the snow. Excessive snow would be cleared from the roof so that the roof structure did not collapse. Now it doesn't snow like that" (H.Ş. Çağlayan, personal communication, June 30, 2019).

Most local communities indicated that the snowfall and cover were greater in the past than they are today. The traditional construction style of the roof

was designed to reduce water penetration in such a damp climate. More recently, easily available, affordable materials like PVC, onduline, and shingles became increasingly popular as an alternative to traditional tiles. Pointing to the sharp decline in the snow cover, T.H. noted:

> When I saw the first great snowfall in our village in 1948, I saw three meters high of snow cover. Two meters and a half. It did not snow in the last two years, including this year...No snow has fallen for the last two years.
>
> (T.H., personal communication, July 2, 2019)

Or as Y.G. put it:

> Here it used to be two meters of snow. Now it doesn't snow that much. A year ago, I measured 85 cm of snow in the garden.
>
> (Y.G., personal communication, July 5, 2019)

The statements on the decreasing snowfall were repeated by H.Ş., who said, "in the past, excessive snow was shovelled from the roofs" (H.Ş., personal communication, June 30, 2019) and F.H., who shared that "it used to snow more before" (F.H., personal communication, January 12, 2019). Despite these harsh climatic conditions in the past, local people managed to maintain the roofs of their buildings. It also became clear that the local climate determined the land use, land tenure, and cropping patterns of the past, which are now facing the consequences of climate change.

The roof overhangs, ridge, and tiling were selected carefully by local people according to the climatic conditions of the district of Fındıklı. *Hartama*, a traditional roof cladding, is constructed with 1 cm thick timber of fir, spruce, or oak, and 2 cm thick timber if made of chestnut. It is built with 1–2 cm lumber as a board-on-board roof installed vertically (Özgüner, 1970). The wood is left to dry; otherwise, if not dried properly, it can bend (Bayram, 2014). This bending can cause the wooden board to lose its function. The roof tiles used today do not cover the roof well as they are not as wide as the wooden boards used in roof construction in the past (Bayram, 2014). Moreover, the underside of the tile is prone to remaining humid as the sun cannot dry this part, leading to its deterioration (Bayram, 2014).

The lanterns outside the attic are installed to provide light for the attic (Engin et al., 2007). These lanterns do not have glass to permit the release of smoke from the open flame (Engin et al., 2007). Natural ventilation of the house is provided in many ways. For example, both entrances on the opposite facades of the buildings allow natural airflow (Engin et al., 2007). Similarly, small and narrow openings in the barn serve the same purpose.

Traditional vernacular buildings are constructed with permeable materials, which allow natural ventilation to help the structure "breathe." If the roof is maintained well, the survival of these buildings over long years is highly possible. Traditionally, occupants incorporated local knowledge of the climate in every design element of the buildings, including the interior. The inclusion of climate-informed interior building elements, however, is not as dominant as those seen on the exterior of the buildings. Other factors, such as the local food culture, have more influence over the interior design of the buildings.

4.1.4 Interior

Water management has always been important for local people when it comes to their daily work and household tasks, such as watering their plants, washing produce, and doing laundry by hand. Water would be transported through wooden water channels, a type of pipe system, diverted from nearby rivers to the interior of vernacular buildings. The small openings between the timber frames were wide enough for wooden channels to reach the building interior. Wooden countertops were used for washing fruits and vegetables, as well as for washing laundry (Figure 4.3). In the bathroom, water was emptied

Figure 4.3 A wooden kitchen countertop for washing dishes and clothes in a vernacular house in Hara Village taken back to the 1830s. Water is carried to the washing area by wooden channels. Photograph by the author taken on July 3, 2019.

through a drain installed on the slightly sloped floor in the shower. In some cases, there was a wooden seat to be used as toilet seat in the bathrooms.

Flooring materials were chosen to help regulate the temperature in the house. Bare soil flooring in the living area would contribute to heating as the dirt surface would maintain the heat from the open fire. The body heat from livestock in the barn kept the barn and its ceiling, the soil flooring of the living room warm enough during winter. Similarly, the location of the barn and animals in the basement facilitated the heating of the flooring of the living space, particularly in the winter months. In the living room where the food is cooked, under the roof, there was an opening in the ceiling to allow for the smoke from lanterns to leave the building, allowing as well for natural air circulation. In the transitional room entryways, there was commonly a wooden floor and ceiling, with the flooring typically elevated one step in order to separate the living room space from the bedrooms (Figure 4.4). All the bedrooms were heated with small open fires. Today, these open fires and chimneys, no longer needed or used, have been boarded up.

Without using heaters and consuming less energy, the timber frame buildings offer thermal comfort. The local artisan Ş.S. argued that "90% of the building is formed by the joints holding timber frames together, otherwise

Figure 4.4 Rooms elevated by one step are visible through the doorway, flanked by wooden cabinets in a vernacular building in Çaglayan. The use of chestnut timber in the furnishings lends a darker appearance to the home's interior. Photograph by the author taken on July 5, 2019.

cold air enters" (Fındıklı coast, personal communication, January 14, 2019). Therefore, the old houses receive a little bit cold. According to the construction master, if it does not take the cold air from the sides or joints, it takes it from the flooring or ceiling (Fındıklı coast, personal communication, January 14, 2019). Emphasizing the importance of thermal comfort in the houses, he described:

> In the past, it [the open fire in the living room] was always on, the fire would burn our face, and the cold would burn our back. We got used to sitting around the open fire.
>
> (Fındıklı coast, personal communication, January 14, 2019)

Supporting the statement of Y.Y. on the humidity in the house, B.U. explained that the "rotten month is July" (personal communication, January 10, 2019). She further added that "formerly, the month of July used to receive excessive rain." Despite the high precipitation and humidity, the thermal comfort in these stone-infilled timber buildings is steady. The dampness is less in these

Figure 4.5 The interior of a vernacular building in Çağlayan Village illustrating the use of wood in the wooden bench with storage areas beneath, chairs, tables, and other interior elements. Photograph by the author taken on January 14, 2019.

buildings as they are built with timber. As "the house is breathing," C.K. claimed that "sleeping here is more comfortable" (personal communication, July 3, 2019). He revealed that "because the interior was plastered, the rooms would not be cold" (personal communication, July 3, 2019). The clay plaster provided insulation in these houses. These buildings are designed to avoid the accumulation of moisture, which leads to damp and staining.

Despite the presence of storage buildings on the properties where many of these homes are located, there was always a need for additional storage in the buildings. Household items stored by residents usually consisted of bedcovers and duvets, food, and many other items. The closets underneath the seating in the living room, kitchen, and built-in cupboards were mainly for storage purposes. Typically, there are timber closets installed on either side of the elevated hallways that lead to the interior rooms. This hallway helps keep the rooms warm by allowing the heat from the open fire to reach other rooms. The timber cupboards have ornamented small holes known as *medina,* which are used to keep food sources such as flour. The design of built-in storage areas and their locations highlights the importance of food in the culture more than the influence of climate on the culture, although keeping food products dry was quite significant in this area. The interiors of these homes traditionally have timber cupboards located throughout, including under the wooden benches in the living room (Figure 4.5). Even small spaces are utilized to maximize storage space, such as for food products like flour and legumes. The decorated interior elements are not only aesthetically pleasing but also serve an important function and reflect a thoughtfulness for practical household concerns such as food storage.

The built-in cupboards separate the living room from the interior rooms for privacy. Even the most modest village houses feature these built-in cupboards with simple woodwork. From wooden floors to cupboards, the frequent use of locally sourced materials was once a common local practice due to the abundance of forests. Today, one can still observe the skilled labor and use of good quality timber and building materials that were put into even these more modest village houses. Together, these elements give a distinct character to Fındıklı's communities.

4.2 Crafting Climate-Responsive Landscapes: Comparative Cases

Similarly, this relationship between landscape, climate, and settlement can be seen in other regions across the world, such as Leh-Ladakh, Miyama Village, and the Dogon villages in Mali. Despite vastly different climatic challenges, all these communities share a deep knowledge of their environment and adapt their spatial configurations accordingly to maximize the potential of their surroundings.

4.2.1 Leh-Ladakh

In the high-altitude Himalayan desert of Leh-Ladakh, traditional water management systems have long sustained agriculture and human settlements

in an otherwise arid landscape. Among these, *zings*—small reservoirs and artificial glaciers—play a crucial role in storing water near cultivated fields (Nüsser et al., 2019). To address seasonal water shortages, the local communities have developed innovative methods such as Ice Stupas, which are artificial glaciers that conserve water in the form of ice throughout the winter (Wagle et al., 2021). These gradually melt during the spring, releasing water when it's most needed for irrigation. *Kul* irrigation channels and snow barrier walls built in upper catchments are other traditional techniques used to harvest and manage water efficiently (Dawa et al., 2000; Wagle et al., 2021). These community-driven adaptations illustrate a deep understanding of the region's unique climate and topography.

The process involves channeling water from streams (usually diverted from rivers or streams during the winter months when water is less needed) into a stupa-shaped mound of snow and ice, inspired by traditional Buddhist stupas (Nüsser et al., 2019). These cone-shaped ice formations allow the water to accumulate and freeze over time (Nüsser et al., 2019). In the spring, as temperatures rise, the ice slowly melts, and the water is released in a controlled manner, providing a source of irrigation water when it is most needed for farming (Nüsser et al., 2019). This method allows the storage of water in a region where natural water sources are limited, particularly during the dry summer months when farming is most critical.

The historic town's street layout, though seemingly irregular at first glance, was intentionally designed to maximize solar exposure (Nasir & Arif Kamal, 2021). Trees are scarce due to the low precipitation and water resources and when available, they are used in the construction of timber (Ferrari, 2018). The flat-roofed and whitewashed buildings of two or three stories are built

Figure 4.6 A row of vernacular buildings, stores on the ground floor, and houses on the first floor in the mountainous region. Photograph by Priyanka Panjwani taken in Leh-Ladakh in 2016.

low to the ground and clustered together (Ferrari, 2018). These buildings are often sharing walls on two or three sides to offer protection from prevailing winds and to enhance passive solar heating through optimized sun exposure (Nasir & Arif Kamal, 2021). They are arranged one behind the other on the sloped terrains, with their balconies overlooking the town (Ferrari, 2018) (Figure 4.6).

Traditional buildings in Ladakh, like those in Tibet, are constructed using thick plastered stones, timbers, and mud in various forms, including sundried mud bricks and rammed earth (Mattu & Prasad, 2024). The use of these materials keeps the building insulated in the winter season while providing cooling during summer months (Mattu & Prasad, 2024).

The building envelopes combine thick stone and mud-brick walls with tightly fitted timber elements, which helps reduce heat loss and shields interiors from cold winds (Krishan, 1996). Additionally, the vernacular buildings typically feature small, shuttered windows to further conserve heat (Ferrari, 2018). Splayed windows set into the thick mud walls enhance the distribution of daylight within the building, thereby reducing the need for auxiliary lighting during the daytime (Krishan, 1996).

Design decisions in this cold, arid region also reflect the impacts of low humidity and strong winds. The ground floor typically features mud flooring, while timber floors are used on upper levels (Mattu & Prasad, 2024). In winter, livestock below the living spaces offer additional natural insulation (Nasir & Arif Kamal, 2021). Wooden beams and columns ornamented are used to span large areas (Ferrari, 2018).

Traditional flat roofs, common due to minimal precipitation, serve multiple purposes. They are designed to support heavy snow accumulation while preventing buildup in high-drainage areas. There is no overhangs of the roof to prevent shading of the surfaces and maximize the solar gain (Krishan, 1996). Furthermore, the roof structure is designed to facilitate natural airflow, contributing to interior temperature and humidity regulation. Mortar, which is made of fine sieved earth with a mix of sand, is used to fill in the space between the stones and the wood in the construction of the roofs (Kaplanian, 1976). As an alternative to mud plaster, cow dung is used for plastering (Sharma & Sharma, 2016). Flat roof tops serve as storing and drying materials, including grass, straw, and sticks for insulation (Nasir & Arif Kamal, 2021). The communal efforts seen in Leh-Ladakh, where local communities collaborate to clear snow from roofs during the winter months, preventing the collapse of the structure.

Leh-Ladakh vernacular buildings incorporate layered interiors, progressing from utility to sacred or sleeping spaces, designed to trap and retain warmth progressively. The interior rooms are notably irregular; often located at different levels and connected by narrow and low passages (Ferrari, 2018). Many of these buildings have two or three large reception rooms, some of which are open to the sky in the center, a design choice allowing for a large fire burning in winter on the floor of the room (Ferrari, 2018). It is common

to find silos with hatch covers below the kitchen ground, where locals store grains and food in cool, dark interior cellars to prevent spoilage (Ferrari, 2018).

4.2.2 Miyama

Miyama Village, located in the northern mountainous region of Kyoto Prefecture, is recognized for its well-preserved *kayabuki* (thatched-roof) houses and its intimate vernacular relationship with the landscape. Miyama translated as "deep in the mountains" (Callomon, 2016) reveals the collective living in the area with its farmlands, water sources, and natural elements of stone and mainly timber coming together. Sustaining the Satoyama landscape,[2] a traditional mosaic of managed woodland and agricultural land, has become increasingly important, especially as Miyama emerges as a destination for ecotourism that values cultural authenticity and environmental stewardship (Duraiappah & Nakamura, n.d.).

Villages are located along river valleys, especially the Yura River and its tributaries. The settlements follow a linear or ribbon-like pattern along roads and rivers, optimizing access to water and flat land for rice farming (Doshita, 2010). Shrines and temples are often located at higher or forested points, symbolizing spiritual protection. Community centers and gathering areas are centrally located in the hamlet (buraku) for festivals and meetings (Doshita, 2010).

The vernacular houses are spaced apart (Doshita, 2010) and oriented for maximum sun exposure and ventilation. The components of the settlement include vernacular house, vegetable garden, storage shed, and sometimes a rice barn or small field (Doshita, 2010). The layout reflects self-sufficiency and integration with the natural environment. Fields and paddies are interspersed with houses, often extending behind or beside homes (Doshita, 2010). This arrangement reinforces local self-sufficiency and integrates agricultural activity into daily life.

The orientation of buildings is deeply influenced by the need to manage heavy snowfall in winter. Roofs are carefully angled to shed the abundant snow that falls in the winter, protecting the homes from structural damage. These roofs feature significant overhangs to protect timber walls from rain and snow, a critical detail in the village's wet and snowy climate (Figure 4.7). These roofs feature significant overhangs to protect timber walls from rain and snow, a critical detail in the village's wet and snowy climate. This design is essential in the wet, snowy climate of the region, where moisture would quickly deteriorate building materials if not properly protected. The southern façades often feature large windows to maximize sunlight during winter, while the northern sides remain minimal and insulated, shielding interiors from cold northern winds.

The traditional thatch roof consists of three layers: a thick outer section of water-resistant miscanthus grass (*susuki*); a middle layer of rice straw, collected from surrounding rice paddies, and a thin base of peeled hemp

Figure 4.7 Thatched roof vernacular buildings in the mountainous region.
Note. Indiana Jo (2016). CC BY-SA 4.0.

stalks that support the outer layers. This traditional three-layer structure was once common throughout the Kitayama region but now remains in use mainly on historic buildings while the rest is covered with corrugated metal cladding (Piddington, 2015). The owners of private residences usually prefer roofs thatched entirely with miscanthus grass because they are more durable. The design of the houses also takes into account the need for ventilation and insulation in the cold climate, using local materials such as thatch that provides thermal insulation and is readily available from the surrounding environment.

The roof consists of three layers: a thick outer section of water-resistant miscanthus grass (*susuki*); a middle layer of rice straw, collected from surrounding rice paddies, and a thin base of peeled hemp stalks that support the outer layers (The Official Travel Guide Kyoto Miyama, n.d.). This traditional three-layer structure was once common throughout the Kitayama region, but now remains in use mainly on historic buildings while the rest is covered with corrugated metal cladding (Piddington, 2015). The owners of private residences usually prefer roofs thatched entirely with miscanthus grass because they are more durable (The Official Travel Guide Kyoto Miyama, n.d.). The use of thatched roofs in Miyama Village aims to protect the structure from harsh weather while allowing for good airflow and ventilation.

Thatching, once a collective village practice, is now carried out by skilled professionals using locally cultivated *susuki* (The Official Travel Guide Kyoto Miyama, n.d.). The work is generally undertaken during spring or summer, and old thatch is often reused as fertilizer (The Official Travel Guide Kyoto Miyama, n.d.). Larger houses are rethatched in stages, one side per year, ensuring that the labor-intensive process fits within seasonal rhythms (The Official Travel Guide Kyoto Miyama, n.d.). In recognition of its cultural value, traditional thatching, along with Japanese timber-framing artisanship, was designated UNESCO Intangible Cultural Heritage in 2020. Furthermore, many of Miyama's 150- to 200-year-old houses were designated as a Preservation District for Groups of Traditional Buildings in 1993 (The Official Travel Guide Kyoto Miyama, n.d.).

Community life continues to play a central role in roof maintenance. Residents work together to clear snow during winter, preventing roof collapse. The roofs, constructed in a hip-and-gable form, are supported by a bamboo framework bound with rope instead of nails, an approach that lends flexibility and resilience in wet conditions. Beneath the roof, the attic serves as a storage area for dried grasses used in future thatching cycles, though many households now also rely on a communal warehouse for this purpose (The Official Travel Guide Kyoto Miyama, n.d.).

These square-plan houses with wooden walls are slightly elevated from the ground. The first room after the entrance area, and the largest in the house, is the kitchen and living room, centered on an *irori* sunken fireplace (Japan Tourism Agency, n.d.). Beyond the living room are a tatami-mat room primarily used for receiving guests, a Buddhist family altar, and the rooms where family members slept on straw (Japan Tourism Agency, n.d.). The thoughtful zoning of living areas, where genkan (entry spaces) are separated from inner rooms (van Thoor & Stroux, 2018) to manage both heat and cleanliness.

Raised wooden floors topped with tatami mats provide insulation and breathability, helping to reduce the effects of dampness in a region known for both high humidity and heavy snowfall. To further adapt to these environmental challenges, Miyama homes rely on thatched roofs and tightly sealed wooden interiors that offer natural insulation against cold and moisture. Additionally, raised storage lofts and built-in cupboards help protect belongings from humidity, rodents, and temperature fluctuations, demonstrating how every architectural element contributes to a holistic, climate-responsive design.

4.2.3 Dogon

The Bandiagara site, consisting of traditional houses, granaries, altars, sanctuaries, and Togu Na, or communal meeting-places, was designated by UNESCO in 1989 with the recognition of its several age-old social traditions that live on in the region (masks, feasts, rituals, and ceremonies involving ancestor worship) (UNESCO, n.d.). Dogon settlements, located across cliffs and plateaus in Mali's Sahelian region, exemplify vernacular adaptation to arid

conditions. In addition to seeking protection from the threat of slave raids, the Dogon strategically chose their settlement site due to its relatively favorable water conditions. Compared to the plateau itself or the sandy plains, both the edge of the plateau and its base provide improved access to water (van Beek, 1993). The sandstone rock formations are capable of storing significant moisture throughout the dry season, while the scree slopes—being the lowest points in the area—collect water runoff (van Beek, 1993). During the rainy season, a small stream flows along the base of the cliff (falaise), further supporting the water needs of the community (van Beek, 1993).

Local people of Dogon have developed intricate systems to conserve rainfall. They even transport soils to bare rock in order to create new fields to cultivate rice or onions (Reij, 1991). In regions with 500 mm rainfall or more, the emphasis shifts from water harvesting techniques to in-situ moisture conservation (Reij, 1991). For instance, Dogon farmers construct small earthen ridges around clusters of sorghum or millet plants to capture and preserve rainfall in place (Reij, 1991). However, these in-situ moisture conservation strategies can become problematic during years of below-average or erratic rainfall (Reij, 1991). In such cases, the total precipitation may be insufficient to support crop growth, and prolonged dry spells during the rainy season can lead to significant crop stress or failure.

Communities here have developed a climate-responsive architecture shaped by water scarcity, extreme heat, and seasonal rains. The primary construction materials, stone and mudbrick, are chosen based on location: dry stone masonry dominates the rocky plateaus, while mudbrick is used along river valleys where clay is more readily available (van Deursen & Raaphorst, 2014).

Dogon settlements exemplify arid-land vernacular adaptations (Figure 4.8). The vernacular architecture responds to water scarcity and heat through material efficiency and microclimatic design. Buildings use dry stone or mud brick depending on location, including cliffs, plains, and sandstone plateaus.

The spatial organization of Dogon villages often reflects environmental and social adaptation. Villages also have numerous flat-roofed, rectangular buildings that serve as living and sleeping quarters for polygamous families that include a man, his wives, and their unmarried children (Wikle, 2016). Smaller homes used by members of the extended family are grouped around the courtyard (Wikle, 2016). Settlements are typically located on cliffs or elevated ground to catch cooling breezes and avoid flooding. Houses are arranged in clusters, enhancing communal defense and mutual support (Bańka & Agnou, 1992). This layout allows convenient access to agricultural fields, reinforcing the integration of architecture with livelihood.

The thick walls of Dogon houses are essential to their thermal performance. Built with mudbrick or stone, they buffer interiors against scorching daytime heat and retain warmth during the colder nights. Narrow windows are strategically positioned, often facing north, to minimize sun exposure while allowing necessary ventilation (Alatalo, 2019).

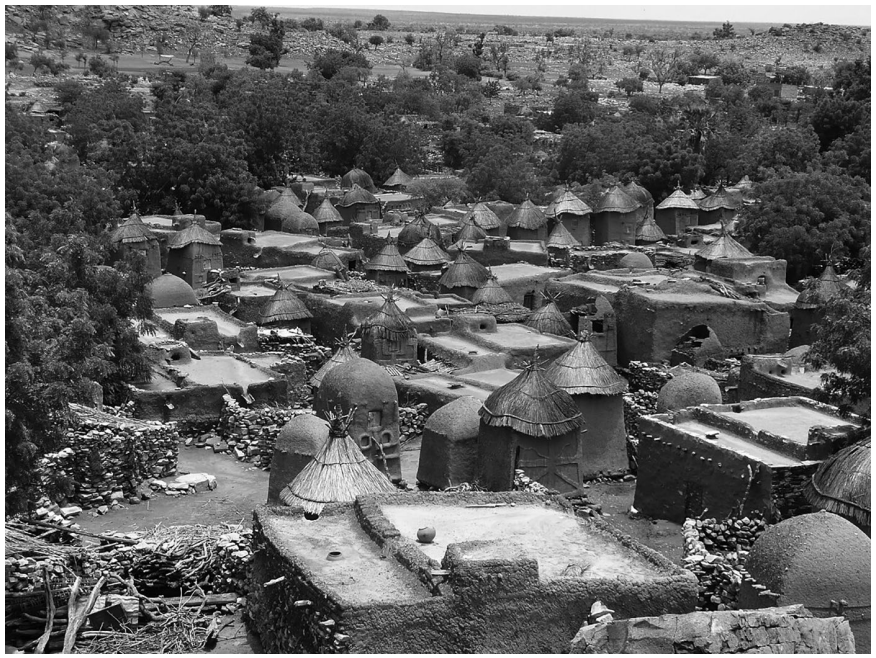

Figure 4.8 Vernacular landscapes of Dogon Village with thatched granaries, Mali.
Note. René Boncompain (2009). CC BY-SA 4.0.

These secure structures provide a greater storage capacity but also prevent rare cases of fire that can be ignited due to the self-heating of dust, and theft that is a direct consequence of food scarcity in areas ravaged by the drought (Douny, 2018).

The roofs—flat and earthen, supported by wood—are occasionally reinforced with plastic or cement for durability (van Deursen & Raaphorst, 2014). Roofs in Dogon villages vary between flat, earthen structures and steep, conical thatch forms. Flat roofs are common on the plateau and are constructed using timber beams topped with earth, plastic sheeting, or even cement in recent years for increased durability (Alatalo, 2019). These roofs are designed to manage intense solar radiation while maintaining insulation. In some regions, conical thatch roofs are used to enhance air circulation and create shaded interiors, with their steep design helping to shed rainwater during occasional storms (Alatalo, 2019).

Since stone can be difficult to find, mud, cow manure, and millet straw are used as building materials with new layers applied at regular intervals to protect building walls from wind and rain (Wikle, 2016).

The façades of Dogon homes reflect this environmental sensitivity. They are solid and often minimally punctuated, carefully crafted to shield from the harsh sun and retain coolness inside (Alatalo, 2019). Earth plasters used on

the exterior also help reduce dust and further stabilize indoor climates (Alatalo, 2019). Small, carefully placed ventilation holes provide airflow while minimizing heat gain (Alatalo, 2019).

Granaries, vital for storing millet and sorghum, are small rectangular structures plastered with thin layers of earth to allow breathability and moisture regulation. These granaries are often placed adjacent to or integrated within living compounds (van Deursen & Raaphorst, 2014). The preservation of harvests depends on these breathable, well-ventilated structures, ensuring food security through the dry season. Both male and female granaries are constructed with mud, dung, and straw over a raised platform of rocks that creates a barrier to insects and rodents (Wikle, 2016).

4.3 Conclusion: Learning Climate Resilience from Vernacular Landscapes

From flood-resilient terraces in Fındıklı to insulated mudbrick houses in Dogon Country, these vernacular landscapes reveal diverse, yet fundamentally similar, strategies of climate adaptation. Each region, whether managing water storage in Leh-Ladakh, snow in Miyama Village, or extreme heat in Mali, demonstrates a collective reliance on local ecological intelligence and environmental stewardship. These settlements offer more than architectural interest; they embody deep-rooted resilience strategies shaped by centuries of experimentation, tradition, and environmental feedback.

The climatic adaptations adopted from the local vernacular architectural tradition show slight variations based on the user-led interventions over time. Vernacular building principles and traditions that have developed over a long period of time and have utilized the steep terrains, rugged landscapes, natural light, and durability and resistance of locally available materials for the establishment of the settlements have contributed to a longer lifespan for these communities. Comparable examples from around the world, such as the stone and timber houses of Leh-Ladakh, the thatched steep-roofed homes in Miyama Village, and the earthen conical dwellings of the Dogon people in Mali, all reflect the universality of these climate-conscious adaptations.

Climatic determinants—solar angles, wind exposure, humidity levels, snowfall, or drought—have deeply influenced the configuration, orientation, and materials of buildings in these places. In Leh-Ladakh, storing warmth in thick earthen walls and housing animals below to heat upper floors. In Miyama, the collective memory of maintaining thatched roofs endures as a seasonal ritual. In Dogon villages, architectural forms are shaped by stories of how buildings protect against both extreme heat and spiritual forces. The main characteristics of the vernacular houses of Çağlayan, like the homes of Ladakhi farmers, Japanese villagers, and Dogon artisans, are their modularity, flexibility, adaptability, transformability, and reusability not just in a landscape that is dynamic in nature, but in shifting social circumstances.

What's at risk is not just the physical fabric of these structures, but the living heritage of *how* people lived with climate, how they insulated and ventilated, stored grain, managed runoff, or cooperatively maintained rooftops.

While the origins of some of these informal practical solutions derive from the literature, climate narratives of the indigenous practices behind the construction of vernacular settlements can be interpreted through their design. These narratives enable access to deep-rooted ecological knowledge—ranging from water channeling and seasonal adaptation, to natural insulation, passive ventilation, and disaster risk reduction. Such knowledge is embedded not just in houses, but across broader vernacular landscapes. These symbiotic relationships between vernacular architecture, ecology, and social life have often been disrupted by modernization, but still carry the memory of generational resilience.

Local knowledge of climate adaptive solutions, whether passed down in Çağlayan, Leh-Ladakh, Miyama, or Dogon communities, can be taken as a methodological approach to identify the risks and damages to vernacular heritage globally. Narratives of climate and vernacular heritage through the landscape can link different temporalities, people, and places to encourage a more ground-up approach to managing vernacular heritage sites in today's conditions (Ferraby & Powlesland, 2019). There is a need for more ethnographic and storytelling methods to identify the reasons behind the design of the vernacular settlements as a part of traditional landscapes. This information is getting lost in the transmission and translation of the know-how knowledge and skills. Considering the insufficient historical documentation of vernacular heritage sites in archival sources, oral stories from local communities and historical photos can reveal much about the traditional knowledge of climate and culture embedded into the construction of these buildings. The result of such analysis can be useful as a learning tool to deduct climate-adaptive design solutions and planning decisions for the future. Architects and engineers can reconsider these decisions in their practices for designing, constructing, and operating buildings and connect them to past cultural practices.

The preservation of vernacular heritage sites is mostly focusing on the documentation of single buildings and the inventories are lacking oral stories about the passive design solutions,[3] the great role of climate in shaping the built environment, and how we can learn to reconnect with nature in designing our settlements. This is to find out what building decisions need to be made to construct buildings climate resilient. Vernacular built heritage and customs of dealing with local climate are interconnected. These buildings are not only designed for the local climate but also for the needs of the society at the time. Revising the use of land and building vernacular settlements of the past illustrates the resilience of localized solutions in construction.

Vernacular settlements, despite the climate-responsive planning decisions behind their construction, are nonetheless extremely vulnerable to modern development projects in their surroundings. National, regional, and city planners in public institutions such as government offices did not adequately

anticipate how their spatial planning approaches and decisions in favor of economic development since the 1950s would increase exposure to catastrophes. Planning for disaster risk reduction conflicts with these investments in urban growth and development plans, which continue to be chosen. As a result, the integrity of the vernacular landscapes, as well as the structures themselves, is being lost and damaged by the hazards.

Notes

1 The phenomenon has to do with the notion of *rant,* which means an income without making any effort. It is mostly used in the context of land, which gains value over a period of time from the investments and government taxation on natural resources.
2 *Satoyama,* combining the two terms of *Sato* (village) and *yama* (mountain), is used to describe rural landscapes of Japan. The concept launched by Satoyama Initiative in 2007 promotes the integrated conservation of local ecosystems, including biodiversity, agriculture, and forestry, outside the protected areas.
3 In the questionnaire that Necati Sen conducted in "Rize'den Bes Ev," he asked building owners about the internal climate comfort of the buildings. The answers reveal consideration for the direction of the wind, climate comfort during the summer and winter seasons, and the dampness in the buildings.

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5 Spatial Planning Challenges in the Preservation of Vernacular Landscapes

Lessons from Fındıklı (1950–1990) and Comparative Contexts

5.1 Introduction

In Rize, challenges arise from climate change impacts coupled with urban planning and development decisions that conflict with climate adaptation objectives, including: preparing for climate change and future hazards; land use planning and policies mindful of the impacts on coastal, riverine and inland flooding; ecosystem restoration solutions; developing resilient integrated water and forest management strategies; protecting the existing historic built environment; and developing new buildings and infrastructure in locations suitable for urban growth. Although there are years of accumulated knowledge on water heritage, floods, and subsequent landslides, all of which have devastated the Fındıklı district and the city since the 1970s, the role of past spatial planning practices and decisions in contribution to these events is disregarded. Moreover, historical spatial planning decisions made around vernacular landscapes (such as land reclamation, city development, flooding, and deforestation) are often overlooked in understanding the interaction between heritage resources and disasters.

In 2024, the Ministry of Interior hosted a meeting in Rize on a monitoring and evaluating disaster risk reduction plan, called *İl Afet Risk Azaltma Planı* (IRAP). The evaluation of nine months of the year 2024 revealed that 1,255 disaster areas were declared by the City of Rize in the last 40 years. In order to minimize the risks, an ambitious collaborative project is being carried out by *İl Afet ve Acil Durum Müdürlüğü* (AFAD) and *Devlet Su İşleri Genel Müdürlüğü* (DSI) on retaining walls, rehabilitation and restoration of rivers via dredging, and desilting of riverbeds from the accumulated fine gravel and soil.

Rehabilitation of rivers is not new to the city since the 2020s, with the construction of a retaining wall along the Çağlayan River. And yet, the problems persist and intensify, leading to local economic challenges. This chapter discusses historical development projects as a catalyst to the increasing effects of climate change, especially on vernacular heritage at a landscape scale. It focuses on the historical development projects of urban growth, river and coastal changes, green roads as tourism infrastructure, and hydraulic dam

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construction chronologically. It further discusses challenges to the district of Fındıklı and to the city of Rize resulting from these threats, both climate and non-climate-related. This study area includes eight villages (Çağlayan, Arılı, Hara, Beydere, Gürsu, Meyvalı, Sulak, and Aslandere) and the coastal neighborhood in the Fındıklı area.

5.2 Urbanization and Population Increase (1950–2019)

Divided by the Çağlayan and Arılı Rivers, the formerly small port town of Fındıklı, Rize, is full of historic buildings, bridges, structures, and religious sites scattered along the rivers and in the hinterland. Just like any other port city, subject to economic forces, migrating populations, and political circumstances, the district has been continuously evolving and developing. The historical transformation of the district was rather gradual and was part of larger, regional infrastructure projects. The Fındıklı district expanded to accommodate urban growth by encroaching on natural resources, resulting in the loss of agricultural lands, disruption to riverine areas, decreased biodiversity, and habitat fragmentation. Further urban growth on the coast, where settlements already existed, was not possible due to the narrow coastline.

With a population of Fındıklı 11,467 residents, 2,988, over a quarter, were located in the coastal neighborhood in 1955 (Başaran, 2020). In the same year, the population of the city of Rize was 211,967 (Başaran, 2020) and the number of buildings was 10,361 (Korgavuş, 2015). This included public buildings, schools, tea factories, and residential buildings. Among these buildings, only 431 were located in urban areas, while the rest of 9,930 were located in the hinterland of the city (Korgavuş, 2015). To give an example from the district, there was only one row of buildings along the coastal street nearby Arılı Valley in 1959 (Figure 5.1). Meanwhile, the riverbed of Çağlayan on the shore was uninhabitable due to marshlands (as supported by the evidence from the local residents in Chapter 3). Due to the natural features, there were no settlements on either riverbed. Historically, people did not build or live in certain areas (such as along rivers, marshlands, and landslide-prone areas or sites which are exposed to environmental threats) due to the unsuitability of those locations. However, that wisdom was being ignored as development pressures further encroached on areas previously considered uninhabitable, which led to many of the issues seen today.

The rise in tea cultivation and resulting demand for migrant agricultural workers led to the establishment of short-term residential facilities where immigrants could live during their stay in the city of Rize. This contributed slightly to the population growth in the district. In 1960, the population of Rize was 248,930, with only 3,701 residing in Fındıklı (Başaran, 2020). Urbanization along the coast rapidly encroached on the riverine areas of the district, particularly along the Çağlayan and Arılı rivers.

The exponential population growth in the city of Rize continued until 1965, which necessitated infrastructure development to allow for easier

Figure 5.1 Freestanding buildings situated along the narrow coastline of the Black Sea in 1959.

Source: Harita Genel Müdürlüğü tarafından üretilmiştir [Produced by General Directorate of Mapping].

access not only to the district but also to other coastal cities. The road along the coast, which was built by Russians in 1916 during Rize's Ottoman Era, was rerouted in 1967 from its original jagged and curved construction. It was rebuilt in 1967 to allow a more direct route along the coast (Yazıcı, 1984). This coastal route connected the two valleys of Arılı and Çağlayan in 1969, as seen in Figure 5.2. In only a decade, from 1959 to 1969, the Arılı

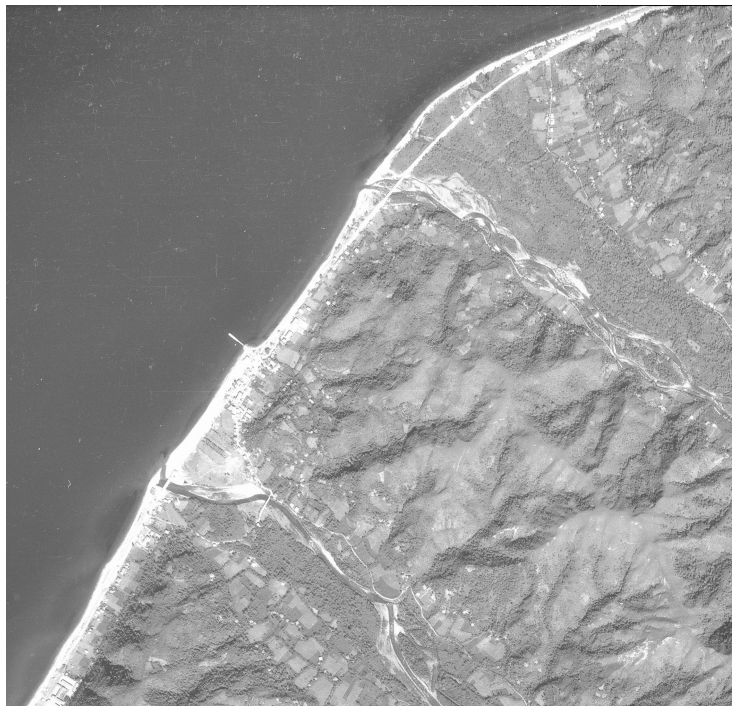

Figure 5.2 The development and growth of coastal Fındıklı, as seen in this 1969 aerial image, is a stark contrast to the same location a decade earlier.

Source: Harita Genel Müdürlüğü tarafından üretilmiştir [Produced by General Directorate of Mapping].

Valley saw a rapid increase in development. On the 1969 map, there were 871 buildings, excluding the historic buildings in the area. The conflictual coastal road of Black Sea known as *Karadeniz Sahil Yolu* was a sign of even more rapid urbanization in the years to come.

From 1969 to 1973, the rate of building construction increased along the reclaimed riverine area of the Çağlayan River and between the two rivers of Çağlayan and Arılı Rivers (Figure 5.3). This growth was relatively gradual compared to the changes in 1975. In 1975, the Çağlayan River maintained its natural formation while Arılı River started to lose its braided form.

As the Black Sea coastline expanded considerably through reclamation and the formation of new urban lands, residents started to build on and occupy the now-available land along the former estuaries and rivers. For instance, the former Arılı riverbank in 1973, which still had the braided form, was already occupied for the development of new buildings in the following years of 1975 and 1982. In 1982, the channeling of the Çağlayan River provided more urban land acquisition on either side of the river for development. The Arılı River Valley also saw an increase in new construction

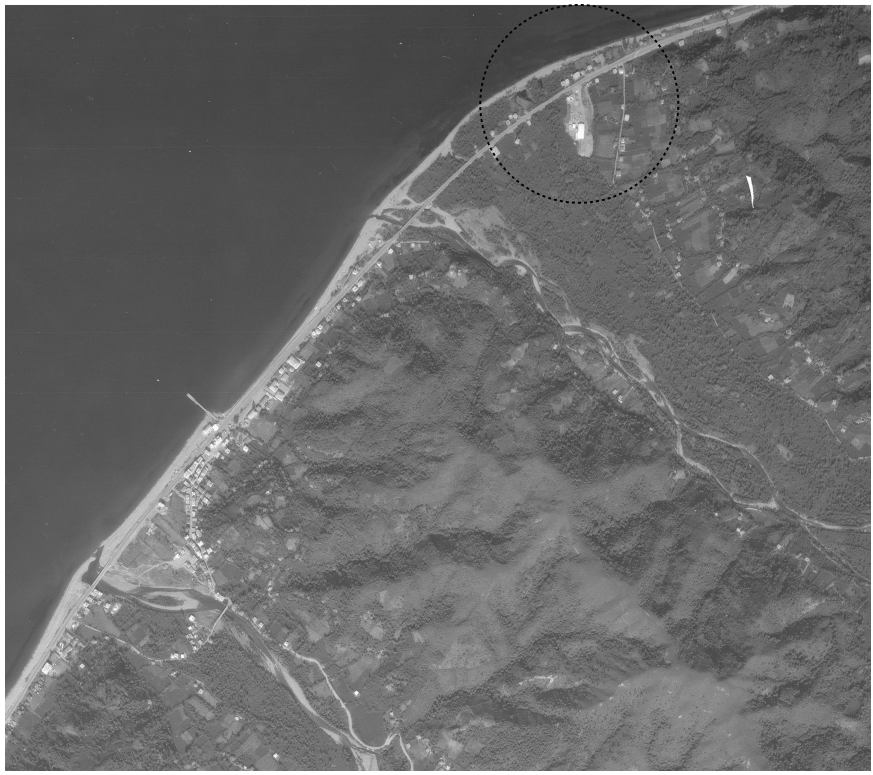

Figure 5.3 An aerial image from 1973 shows the extensive construction along the coast, marking the start of large-scale deforestation in the area.

Source: Harita Genel Müdürlüğü tarafından üretilmiştir [Produced by General Directorate of Mapping].

at this time. After this expansion on both sides of the river, the newly created land was later opened for development. Since then, the population growth has continued, though at a slower pace, until the 1990s, when the decline of the tea industry resulted in less development. The depopulation since the 1990s was reflected in the spatial planning and transformation of the city as the district started to slowly form the urban fabric that makes up Rize today (Figure 5.4).

The coastal settlements along both rivers did not exist until the late 1950s, highlighting the extent of the coastal transformation over time. The development of the rivers, which were later narrowed, led to the formation of new land and allowed for the construction of more buildings. In the name of "The rehabilitation of rivers," the infilling of the coast, and urban growth were part of the national government's "urban transformation" project. These changes led to unintended environmental consequences, affecting ecosystem dynamics, increasing flood risks, and triggering landslides. These negative impacts

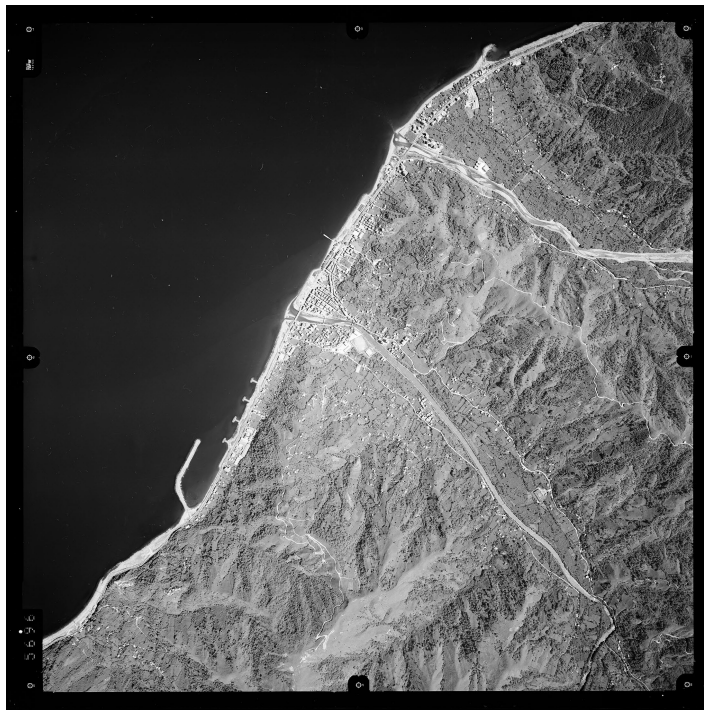

Figure 5.4 This 2002 image of the Rize coastline and riverbank settlements shows a more defined urban geography.

Source: Harita Genel Müdürlüğü tarafından üretilmiştir [Produced by General Directorate of Mapping].

would later be criticized by the public and non-governmental organizations (NGOs) for the damage that the urban transformation caused. Because the current coastal infrastructure and settlements are not resilient enough against such disasters, the wisdom behind the modifications on the coast and rivers is now being reconsidered. While historical images help us to trace the spatial planning decisions made, the implications of these changes on vernacular heritage sites are not evident from the interpretation of these images alone. A closer look at the spatial planning in relation to heritage sites, achieved by overlapping historic images with more recent maps, better reveals the extent of the damage done to these heritage sites.

5.3 River Channelization and Coastal Transformation (1969–2019)

Devlet Su Işleri (DSI), General Directorate of State Hydraulic Works in Türkiye is the primary executive stakeholder for the elimination of adverse effects of surface and groundwater and putting them to public utilization. Running

on a separate budget and juridical personality, it is established under the Ministry of Public Works. Tasks involved but not limited to can be listed as flood control and mitigation, build irrigation, generate power from water resources, and examine, supervise, and approve the water supply and sewerage designs. The regulations, inspections, and executions of water works of the city of Rize and its district of Fındıklı are under the organization of Regional Directorate-22. Region Trabzon whose historical records revealed that the flooding history of Fındıklı's major rivers of Çağlayan and Arılı only dates back to 1974 (General Directorate of State Hydraulic Works, 2019). From 1990 onwards, records include the names of villages, districts, and neighborhoods in the city of Rize that are listed as disaster-prone areas due to an increase in the frequency of flooding events in 1997, 1998, and 1999 (Reis et al., 2008). The village of Çağlayan in Fındıklı experienced 24 flood events in June 2002 alone (General Directorate of State Hydraulic Works, 2019) whereas 23 river flooding events occurred in September 2012, which is typical for summer and autumn months. An increase in precipitation, rainfalls, and humidity in recent years has accelerated the frequency and severity of river flooding in the area (Yalcin, 2007). Records show that, over the past 46 years, the months of June and September have shown a pattern of river flooding, and resulting landslides, in the area. These events resulted in fatalities and evacuation of many villages in addition to damage to both newly constructed and historically significant buildings. For example, due to heavy precipitation in 1990, 89 people died in 18 fatal landslides, affecting more than 20 settlements in Trabzon, Rize, Artvin, and Giresun provinces (Nacar et al., 2024).

Riverine areas exposed to human intervention and modifications to their natural state may influence the upstream and downstream fluvial processes (Hohensinner et al., 2018). Often, river alterations change the natural water flow, velocity, and other processes. For example, by widening the water channels and increasing the diversity of cross-sections where two rivers converge and where stream restoration is limited can help restore the natural flow, volume, and discharge of the river. However, new policies opening these floodplains to development threaten to expose rivers to more disruption.

Since 1969, there have been major interventions to the rivers of Çağlayan and Arılı. In 1969, the river estuaries of Arılı and Çağlayan were narrower, which enabled the expansion of riverbanks and development extending toward the center of the district. However, in later years, the river estuaries expanded despite narrowing the river channels. Although the river course was not altered, its converging tributaries were narrowed and realigned with the downstream channel causing seasonal flooding to become more extreme. However, the morphology of Arılı has been slightly modified on two diverging streams.

The Çağlayan River used to have diverging tributaries, comprised of a large watershed, that have been substantially realigned and corrected (Figure 5.5). In 2019, the division of the streams was altered completely by

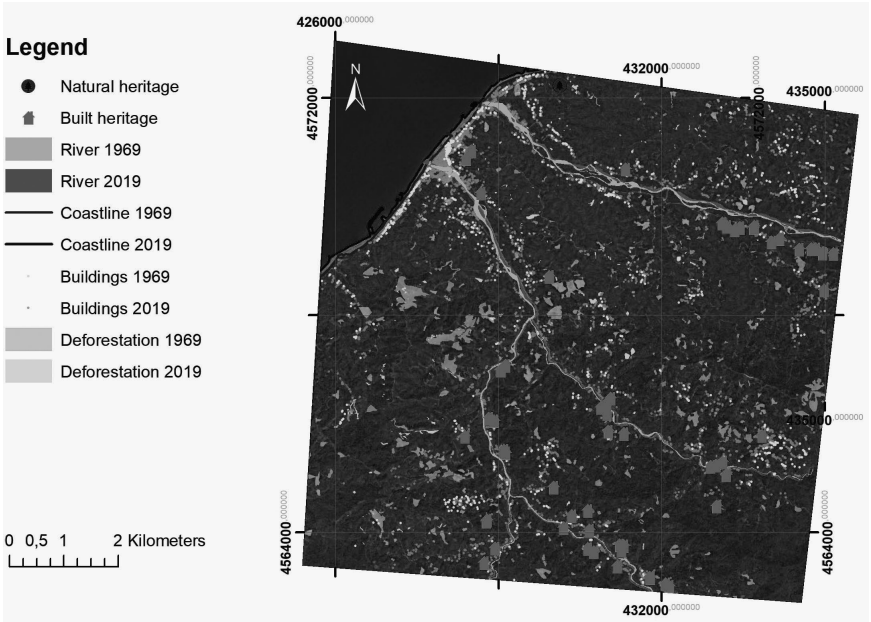

Figure 5.5 Map of the coastline and major rivers of Fındıklı along with the locations of natural and built heritage sites, and buildings in 1969 and 2019. The map identifies areas of deforestation in 1969 and larger-scale deforestation in 2019.

Source: Aktürk & Hauser (2021).

making a straight channel, which increased the pressure of the water flow. One implication of this was the densification of floodplains, which eventually put these newly built houses under the pressure of river flooding. Urban densification increased, as concrete buildings with many stories were constructed near the riverbeds following the straightening of the river. According to DSI reports, a primary cause of the increased river flooding is rubble from the construction of new homes being deposited into the riverbeds. This blocks the water flow, particularly around river bends and beneath bridges. Given the significant impacts, the influence of extreme shifts in channel shape cannot be overlooked.

The riverbeds of Çağlayan were naturally branching out and widening to a larger area where only one vernacular house is located (Figure 5.5). Unlike the river in 1969, today the river flows rather straight, allowing access to cars via bridges and roads along the river. The site selection of vernacular houses was not arbitrary, and historically, they were built far from river flood plains. Away from the flood plains, the majority of these buildings survived the flooding disasters, while the district center was flooded multiple times. In 1973, rehabilitation of the Çağlayan River and its converging tributaries was not yet completed. In 1975, Arılı River was narrowed and the former

riverbed area on the coast was opened to the construction of settlements. The rehabilitation of the river extended beyond the coast to the rural areas.

The construction of a sea wall in the east shown on the 1982 map shows the extent of the coastal developments on this side of the Çağlayan River. These coastal defense structures, built to guard against coastal flooding and erosion, have become a topic of critics in today's coastal management field, which now favors soft engineering solutions, as opposed to hard structures. Hard structures such as sea walls and rip rap disrupt the natural shoreline and habitats in the long term. Nature-based solutions such as the plantation of trees, increasing biodiversity, vegetation rehabilitation, and living shoreline allow "room for the river"[1] and provide recreational areas along the coast. These solutions that provide ecological and community benefits are more sustainable and cost-effective. In the past, however, hard engineering solutions, though relatively expensive, were preferred at the time to minimize the effects of damage to properties and infrastructures by protecting them from the elements.

As one example, an infill project on a section of Black Sea coastline from Samsun to Artvin covering approximately 542 km, known as Karadeniz Sahil Yolu (Black Sea Seaside Highway), connects the coastal cities of the Black Sea region in Türkiye (Alkan & Yazıcıoglu, 2018). With the infilling of the road, the Black Sea Coast Way became a highway in 1990. This highway officially opened in 2007. On a negative note, the construction of the highway not only cut off the direct access of local residents to the sea but also destroyed historically important coastal settlements. The expansion and reclamation of the coastal area to remote areas in the hinterland led to the abandonment of the living heritage of waterfront areas. The identity of this small port city, tied so closely to the sea, has been irreversibly lost due to the disruption. On a positive note, after the completion of the project, the city started to grow toward the sea, using infill rocks to claim new lands and creating a new coastline to support additional public spaces.

This road was built to reclaim the sea and expand the amount of land along the coastline. Doing so created valuable land that was in high demand for development due to its coastal proximity. The former mayor of the city of Rize, Ekrem Orhon, would later be known as the person who turned the sea to land, and land to money as he spearheaded a new policy that allowed for the construction of three-story and taller buildings on the reclaimed land.[2] The resulting controversy between the public, the Chamber of Civil Engineers in Rize, and the government reached its peak when reports revealed that the buildings in this area cannot be salvaged.[3] Because these buildings, which were built after with three-story policy, lean on each other and their foundations eroded in the salty water of the sea, they would have to be destroyed.[4]

In this new territory, harbor facilities with new seawalls were constructed along the coast as part of the redevelopment project. The erosion of rocks underneath the infrastructure has now become a problem for land reclamation in the coastal area of Rize (Erten & Rossi, 2019). Coastal planning

and development due to changes in the river morphology have increased the flooding risks to coastal lowlands and riverine areas. Both coastal flooding and inland flooding are affecting the surrounding settlements and infrastructure. Although the geographic location of the vernacular heritage of the hinterland seems to be far from these developments, the pressure of the coastal and central areas is nonetheless impacting hinterland as construction in the hinterland increases due to land scarcity on the coastline. In addition, the drastic changes to the river geography have allowed for urbanization.

The government's plans to grow on the coast did not stop there but only spread to the inland areas with the construction of infrastructures and settlements, though on a smaller scale than on the coast. Yet, the inland flooding affects the hinterland almost as much as it does the coast. The economic value of the hinterland also increased alongside government-initiated highland tourism projects.

5.4 The Impact of Deforestation on Landscape Transformation (1969–2019)

Mismanagement of wood resources in rural areas is also an important phenomenon to analyze as deforestation is not its prime consequence. The disappearance of local forests is affecting biodiversity, the presence of which promotes the protection of other resources and many livelihoods. In the rural area of Fındıklı, urban expansion started in 1969. The exploitation of forests in Fındıklı has been ongoing since the 19th century, back when timber was used as a means for trading. Chestnut timber was used in the construction and furnishing of vernacular houses. Along with the growth of once sparsely populated areas, planned and unplanned large-scale clearings of natural areas took place, particularly in forests. The increasing number of houses went hand in hand with an increasing demand for wood, and the depletion of forest areas grew in scale. In addition, the cultivation of large areas for tea and hazelnut fields in support of the local economy increased the risk of landslides on the hillslopes, now devoid of their natural vegetative cover.

Vernacular house owners who also have ownership of small-scale tea, hazelnut, and vegetable gardens would often clear small areas to create roadways for their vehicles and grow pastures and crops. Heavy rains and landslides became more common as the land was cleared at a large scale, destroying farmlands and crops in the city. Many residents of Fındıklı blame dam construction and the increasing demand for land for the changes in regional weather patterns. Interviews with residents reveal that tea plantations could not prevent soil erosion. It is said that the establishment of tea plantations and the construction of roads through rural areas increased the rate of soil erosion. In addition to agricultural activities, economic and political interests in the area also played a significant role in deforestation.

The deforestation of vast expanses of forests (Figure 5.6) started with selling timber stands in auctions to private companies who then depleted

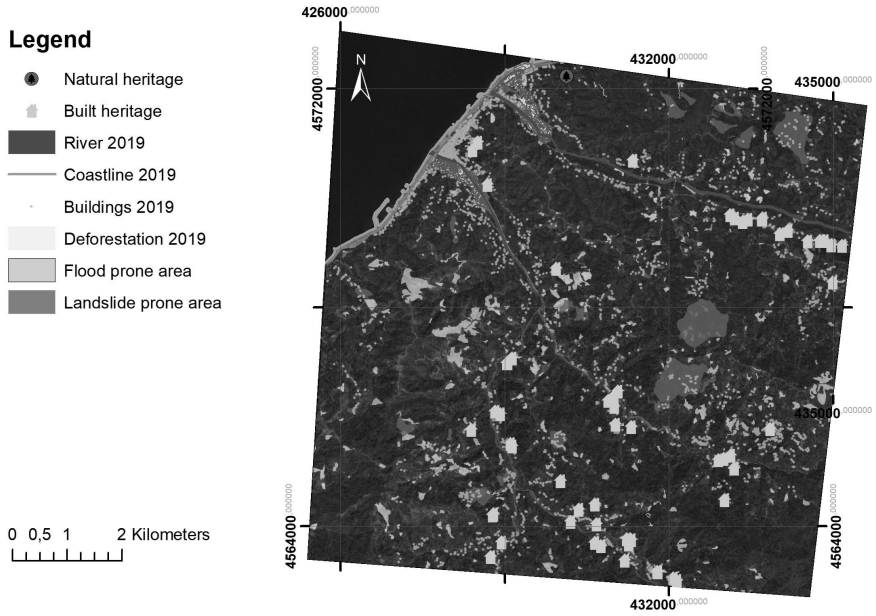

Figure 5.6 This 2019 image indicates areas of recent deforestation, as well as flood- and landslide-prone areas.

Source: Aktürk & Hauser (2021).

the forests for economic gain, such as large-scale housing development. This level of destruction cannot be attributed to the actions of local communities but rather to planning policies at the governmental level. One example is the construction of the "Green Road," a national project that started in 2016 to connect the high plateaus in the hinterland and support rural and nature-based tourism. The road's development led to vast deforestation of lands in the district and the region.

The overlay of the maps of 1969 and 2019 reveals that most of the deforested areas are matching and growing in scale in 2019 at an alarming rate (Figure 5.6). The combined map also shows the correlation between landslides and "over-exploited" lands. The distribution of these small patches was sparse in 1969 while in 2019 the deforested areas became more densified in the northwest direction. Many settlements located around these patches, including vernacular houses, will likely disappear because of landslides (Figure 5.6). The damage from these impacts, such as the destruction of vernacular houses and storage buildings, is clear to observe, though not documented. While exacerbated by this rapid development, erosion is a process natural to this area. Each summer, the snow cover up in the mountains melts, accelerating the flow of the rivers. Combined with heavy seasonal rains in June and July, river flooding intensifies, forcing residents of historic buildings to abandon their houses, according to the interviews with local people.

In light of climate change projections signaling an increase in humidity and rainfall in the area, the rising effects of floods and landslides due to anthropogenic interventions call for attention to cultural heritage sites. Heavy rains can trigger floods, which are frequently accompanied by landslides. Following heavy rainfall and river flooding, cultivated and deforested areas cannot withstand the volume of water, and soil washes away, provoking devastating landslips in the hinterland that place lives and livelihoods at risk. Despite this growing risk, current decision-making patterns, including national tourism strategies, continue to be driven by development rather than taking climate adaptation into account.

5.5 Site-Specific Threats on the Vernacular Settlements

Map analysis indicates that few vernacular and natural sites are under threat of floods and landslides, compared to newer buildings. Results also suggest that the growth of unplanned spatial development can aggregate existing risks of deterioration for some of the sites. The greatest disaster-prone surface is located between the valleys of Arılı and Çaglayan and in the northeast part of the Çaglayan River.

Flooding data provided by DSI does not cover the areas beyond the coast although the Beydere Village is heavily impacted by floods and landslides (as explained further in Chapter 7). Beydere Village, along the Çaglayan Valley, is one of the villages that has lost its vernacular characteristics with the construction of new buildings. Flood defenses previously limited to the area around Beydere Village were now extended to Çaglayan Village due to the increasing and intensifying effects of floods. The DSI 22nd Regional Directorate determined these extensions based on an estimation of the construction and materials cost, estimating the necessary height of the flood protection and control structures based on the geometry of the streambed (Kerim & Süme, 2019). Vernacular houses near the flood defenses in lowland villages such as Çaglayan reveal that grand mansions, such as the one in Figure 5.7, are also in danger.

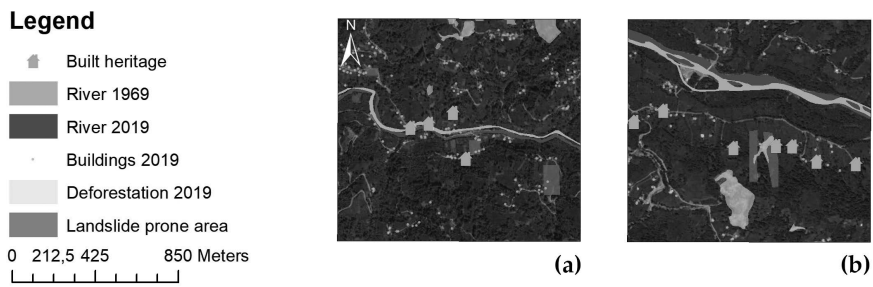

Figure 5.7 Sulak house (a) and Sevket Atac and Sevketbeyoglu houses (b) under threat of landslides.

Source: Aktürk & Hauser (2021).

In some cases, the deforested areas intersect or precisely overlap with risk-prone areas, supporting the argument that deforestation multiplies the risk factor for events such as landslides. In Figure 5.6, an unlisted natural heritage site known as Saricam Forest is located in a deforested area. In addition, clusters of newly built houses can be seen in landslide-prone areas, shown in red. In a close-up view of the map, one historic building, Sevketbeyoglu House, can be seen positioned at the intersection of the deforested and landslide-prone area (Figure 5.7b), whereas a few houses, such as Sulak Village House (Figure 5.7a) and Sevket Atac House, remain in close proximity to landslide-prone areas (Figure 5.7b). The two houses of Sevket Atac and Sevketbeyoglu are located side by side in the deforested and landslide-prone area. As shown in the figure, the threatened sites are located in Çağlayan and Sulak villages. Three out of 58 vernacular built heritage were situated in the landslide-prone areas (Figure 5.7).

Vernacular heritage in Fındıklı was built with consideration for the local climate, topography, and other factors, which is why these sites are considered to be disaster resilient. Most were constructed upstream and on high grounds to avoid damage from river flooding. It is clear that the builders of the vernacular houses understood the environmental risks of the location and adapted to it, rather than trying to adapt the environment to their needs. However, as deforestation grows in scale, flooding will trigger more frequent landslides and more historic buildings will become vulnerable to natural disasters. As historic sites are not the priority in spatial planning decisions, AFAD maps do not identify these areas in disaster risk mapping. Therefore, data on heritage sites and their surroundings is critical to include in integrated disaster risk mapping.

In addition to growing development pressure and the establishment of hydro-electric plants along the rivers, there is also an increasing demand for land for the construction of new buildings, which is often pursued through the establishment of roads that surround historic sites. This combination of interests and demands makes it difficult to safeguard these vernacular areas. This combination of factors contributes to the artificialization of the land and the creation of buildings or urban areas in risk-prone zones. According to calculations completed in ArcGIS, the deforested areas in 1969 covered an area of 0.325789 km^2, compared to an area of 2.598385 km^2 in 2019. Landslide-prone areas determined by AFAD and DSI reveal that a total of 3.367975 km^2 are identified as at-risk areas. It is evident that one house from the first image (Figure 5.8a) and two houses from the second image are located nearby the landslide-prone areas (Figure 5.7b).

Interviews with local people (see Chapter 6) support the results of the maps, with residents making statements about damages to vernacular buildings, such as façade deterioration and loss of materials (Figure 5.8). The villages of Derbent and Beydere, which are known locally to be located within disaster areas, are indeed confirmed to be disaster-prone areas on the maps. Karaali Village along the Arılı Valley does not seem to be within a disaster-prone

Figure 5.8 The degradation of the rear façade of the Ş.A. House due to landslides in Çağlayan Village in Fındıklı of Rize.

Source: Aktürk & Hauser (2021).

area, although interviewees mentioned that historic houses in that village have also been severely affected by landslide damage (see Chapter 6). As the spatial analysis conducted does not identify the loss of buildings or damage to them, the map may not agree with the statements from the interviews. Thus, the commonalities and discrepancies between the results

of mapping and interviews can be useful in detecting threats on vernacular heritage sites at various scales. Neither interviews nor mapping alone gives a complete picture, but combined, can provide a more holistic view of the situation.

5.6 The Green Road Project and Its Influence on Tourism from 1990 to 2019

Between 1980 and 1990, plateau tourism gained momentum with the arrival of services supported by new infrastructure, including electricity, water, and hospitals (Somuncu & İnci, 2004). In the name of revitalizing plateau tourism, the Ministry of Culture and Tourism announced its strategy to actualize the "Corridor of Yayla (Highland) Tourism" project in 1990, which aimed to provide access to the most inaccessible plateaus and highlands. To achieve this, seven-meter-wide and 2,600-km-long asphalt roads were constructed to connect the highlands from Samsun to Artvin, a path that included Rize (Bekdemir & Sezer, 2022). This mega tourism infrastructure project aimed to promote the region's tourism opportunities, including winter activities, food and culture, and coastal offerings. Along this newly established route, hotels, restaurants, bungalows, recreational spots, and other hospitality services were constructed in anticipation of an increasing number of visitors. While this new accessibility to the plateaus and summer pasture activities saw an increase in the number of visiting tourists, the natural environment suffered from the influx of development, resulting in fewer visits from local residents.

With the Green Road Project now connecting the nine regional provinces and made possible transportation to the most remote areas, it also increased the tourism potential of the region overall, according to a report from the Ministry of Culture and Tourism, "The Tourism Strategy of Turkey 2023 Action Plan 2007–2023" (Türkiye Cumhuriyeti Kültür ve Turizm Bakanlığı, 2007). Driven by the Eastern Black Sea Project Development Programme (DOKAP), this controversial project took four years to complete.

The loss of vegetation and forested areas, biodiversity, and landscapes are visible adverse consequences of the project. In addition, the project potentially decreased local income sources due to the loss of lands as well as the local identity and culture. So-called rehabilitation of the roads meant the paving over of natural areas, replaced by asphalt roads, which directly contributes to climate change. While promoted as sustainable eco-tourism effort, the construction of such large-scale infrastructure in the name of promoting highland tourism opportunities such as adventure sports, such as camping, skiing, caving, and paragliding, brings capital. However, it comes at the cost of the environment and can bring other detrimental impacts.

The potential of country tourism in the city of Rize with its high plateaus has only been recognized in the last five years. Deficiencies in the number of hotels, direct flights, and other services in the city have previously signaled the absence of interest in public and private investments in tourism for the area. Nonetheless, small-scale local tourism in Rize is rapidly changing the city into

a greater capitalist center with the construction of its first airport in May 2022 and a growing number of hotels on the high plateaus in recent years.

Considering that the majority of plateaus are located in the city of Rize, this tourism growth will have unequal effects on the region. Some cities and communities will be affected more than others. In addition, the introduction of structures that are incompatible with the heritage of the historic settlements will effectively pollute and spoil the area's aesthetic. This massive, unplanned growth not only destroys the natural and cultural heritage of the Kackar Mountains but also the intangible values of local communities, such as the transhumance tradition of moving up to the mountains in the summer.

With the changing climate, the Black Sea region will be a desirable summer tourism destination. Other Mediterranean regions are anticipated to face increased drought and temperatures due to climate change, which will cause them to lose preference as a summer tourism destination. With this in mind, Black Sea region governments are investing in new tourism revenues to promote the area as the most suitable place for summer tourism activities. For example, fishers' shelters throughout Rize are now opening for yacht tourism in anticipation of this opportunity.

The policies for sustainable tourism and the title of the project (Green Road Project) appear to be contradictory, as so far, this infrastructure has been built in the interest of economic development rather than sustainable development. So far, the expansion of road networks together with the construction of buildings along the roads and rivers has already increased the threat of floods and landslides in the area. Burning coal for energy also continues to be part of the unsustainable growth of the city, as it not only increases air pollution but also damages the ozone layer.

Hydraulic Works often emphasize in their reports that the rivers become blocked by the debris from nearby construction of buildings, which they claim is the main cause of the flooding. They blame locals for constructing buildings too close to rivers. While this may have some impact, it cannot be compared to the large-scale development projects such as the construction of the Green Road. Moreover, the construction of touristic centers on a great scale is signed off by the municipality. Without public input, these spatial planning decisions often lack transparency and ignore the views of locals as afar as how they want to their communities to be shaped and utilized. In addition, the regional climate actions for the Black Sea region, which is announced by the Ministry of Environment, Urban Planning, and Climate Change, do not compensate for the destruction done by the development decisions that permanently transform landscapes and cities.

5.7 The Impact of Small Hydropower Plants on Landscape Change, 1996–2019

These spatial planning decisions operated not only on the land but also on the water in the rural landscapes with the government's planning of hydropower

plants in search of alternative energy sources. Hydro-electrical power plants convert the energy of flowing water to generate electricity. The search for renewable energy sources began globally operating in the late 19th century in the United States. Given the current level energy demand, the government of Türkiye still has the potential to follow the trend of using this energy source.

A hydro-electrical power plant system consists of three parts: a power plant that produces electricity, a dam to control the water, and a storage area (Tkáč, 2018). The largest power plant producers in the world are China, Russia, the United States, Brazil, and Canada (Schmitt & Rosa, 2024). Hydro-electrical power plants can supply large amounts of cleaner electricity. The reservoirs collect the snow and rainwater for irrigation and consumption (Schmitt & Rosa, 2024). These large-scale projects can greatly benefit the economy and drive development by bringing electricity necessary for infrastructure, industry, commerce, and communities by utilizing the significant amount of rainwater that the Black Sea region receives.

Despite disputes around environmental issues among scholars and the public over the construction of these structures, the reliance of the country on its hydraulic capacity has not declined. The issues revolve mainly around the disruption of the flow of water resources (Anderson et al., 2015), ecology and natural habitat (Abreu et al., 2020), displacement of the surrounding communities (VanCleef, 2016), greenhouse gas emissions (Ocko & Hamburg, 2019), and the loss of arable lands (Chandy et al., 2012). The consequences of the construction of hydropower plants do not only relate to the migration of human populations but also to marine wildlife. For riverine communities whose income relies on seafood, construction of hydro-electric facilities results in the loss of fisheries, causing the local economy to decline. In the context of climate change, scholars recognize the consequences of hydropower plants and propose the need for an environmental assessment of them (Akstinas et al., 2024). Most importantly, the destruction of local cultures and historical buildings in the geography that these structures are built on is clearly visible.

The production of electricity through hydropower plants in Türkiye dates back to 1902 when a 2-kW hydropower system was connected to a water mill in Tarsus (Kemal Ozturk et al., 2007). In Europe, Türkiye now ranks as the second-largest hydropower producer, after Norway. The region offers many advantages for constructing hydropower plants due to its characteristics, such as extreme rainfalls and steeply sloped terrain that generates runoff (Uzlu et al., 2011). The first hydro-electric power project in the city of Rize was on the Firtina Plateau in 1996 by the BM Holding (ATVUR, 2014). The rivers of the city of Rize are important in meeting the needs of the electrical energy of the nation (Aktürk, 2022).

There are currently no hydro-electrical power plants in Fındıklı, even though there were attempts to construct power plants (as of now ten projects are at the stage of being developed) along the rivers of Çağlayan and Arılı. However, strong opposition from local people has thwarted the realization

of these development plans. Due to much local income being dependent on agriculture, locals protested that their lands were to be used for the construction of a hydropower plant. Nonetheless, the amount of hydro-electrical powers along the rivers of Rize is increasing despite the existing vulnerability of mountain ecosystems and the disputes by local people over the proposed new constructions (Doğan, 2024).

The conflict over the construction planning of hydropower plants in the district of Fındıklı dates back to 2007. Ayen Energy Inc., a Turkish energy company, proposed the construction of the Fındıklı Pasalar Regulator and Hydroelectric Power Plant in 2006 in Çağlayan Valley. However, this initiative received backlash from rural populations, including farmers and villagers (particularly women), alongside support for the opposition by NGOs, associations, activists, and scholars (Şahinde & Şendeniz, 2013). In 2007, Zeki Enerji planned a hydropower plant in the Arılı Valley. Thanks to the effort of local communities, the Arılı Valley was successfully registered as a first-degree protected site. Despite the company's appeal to remove the registration, local residents won the resulting lawsuit. Similarly, the designation of Fındıklı Valley as a first-degree natural protected site in 2008 helped ensure the conservation of the area from further development. So far, the designations of these valleys has helped local residents prevent the construction of 16 planned hydropower plants in the area.

The disagreements around spatial planning decisions and local practices have continued through legal battles in court, with utility companies pressuring for deregistration of the now-protected sites, the removal of which would allow for the implementation of the projects. T İSTYAP, a private energy and construction company, planned to start implementing a project called "Gül HES" on the Solarez river stream of Çağlayan River in August 2019. However, the location of the planned project encompassed forested areas. Based on a law (decision number 6831 dated August 31, 1956, "Orman Kanunu"), the company must obtain special permission from the Ministry of Environment and Forestry in order to build in such a location.

Local opposition to these projects is due to concerns that such construction may exacerbate flooding in the area and the land may be degraded in addition to the risks multiplied by the changing climate. For instance, in the case of the flood of Trabzon in June 2019, the construction of the hydrological power plant was held responsible. In addition to flooding, construction of large-scale utilities could have other detrimental impacts, including loss of vegetation cover, disruption to natural resources such as fish populations, and loss of cultivated farmland. Following these impacts, displacement of rural communities is a real possibility.

In the case of the application of the stopped or canceled projects or the new ones, there is a greater risk for meadows, villages, valleys, rivers, and forests (Asrav, 2019). The majority of water resources, settlements, and forests are preserved by the regional cultural heritage agency. Therefore, legal battles between local communities and public-private institutions is likely to

continue. There is a need for consideration on how to approach the conservation of the area at a landscape scale, as the damage does not only affect vernacular heritage but also the surrounding region.

Considering the vulnerabilities and exposure to natural risks, which are worsening in the face of climate change, these areas must be preserved. Spatial planning decisions currently permitted allow for land reclamation and construction of dams that could jeopardize the ecological integrity of the area. A hydro-electrical power plant (HES) is planned for the Solarez Riverbed along the Çağlayan River. The construction of a dam in this area will likely exacerbate the current river flooding (Aktürk & Hauser, 2021). Planning for a hydropower plant in the area is ongoing while the threats resulting from its construction grow, especially in the hinterland. Mapping of the threatened vernacular sites does not indicate the unrealized projects of small hydropower plants, but the resulting flood risk is noteworthy in the vernacular landscapes.

5.8 Hydrological Transformation, Tourism-Driven Development, and Deforestation: Insights from Comparative Cases

Historical planning decisions, such as land reclamation, city expansion, and deforestation, have disrupted vernacular landscapes, much like what has occurred in Leh-Ladakh, Miyama Village, and the Dogon region. In each of these contexts, local communities historically avoided vulnerable areas, steep slopes, marshlands, or floodplains, guided by generations of climatic wisdom. Yet, post-1950s development pressures have overridden this indigenous knowledge with formal planning strategies that often neglect natural constraints.

5.8.1 Leh-Ladakh, India

The vernacular landscapes of Leh-Ladakh, where buildings were constructed above flood lines, oriented for thermal gain, and integrated with terraced agricultural systems, are disrupted by flooding and landslide risks. These risks are exacerbated by post-1970 development, including unplanned urbanization and road-widening projects, tourism facilities, and military installations, which disrupted traditional water flows and permafrost stability (Ali et al., 2024). In particular, the 2010 cloudburst disaster in Leh, which resulted in catastrophic flooding and loss of life, highlighted how haphazard urban development on dry riverbeds (Mueller et al., 2019), formerly avoided in vernacular site planning, severely compromised local resilience.

After easing access restrictions in 1974, decades of expansion have resulted in urban sprawl without limitations or guidance about building in hazardous areas. Migrants and modern infrastructure have expanded development into less desirable areas around Leh and nearby villages, turning stream beds,

sediment laden hillsides, and rocky cliffs into residential areas and sites for vital infrastructure (Mueller et al., 2019).

The river course of the Digar stream was changed by straightening the stream, later causing damage to houses that were constructed 20–25 years ago in areas traditionally considered unsafe (Arya et al., 2010). In some cases, small wooden bridges over minor streams remained intact, indicating a negligible amount of rainfall and minimal impact on the adjacent hill compared to the one where the most severe devastation occurred (Arya, 2010).

These disasters have disrupted the Himalayan ecology in several states, and the cause and magnitude of these disasters have been made worse by human activities, including building highways, dams, and deforestation (Nagamani et al., 2024). In 2014, Nimoo-Bazgo Dam was completed on Indus River in Ladakh region of Indian-held Jammu and Kashmir (Irfan et al., 2019). Despite their benefits, the hydropower development is one of tension between energy production and the preservation of cultural and ecological landscapes. In Leh-Ladakh, India, high-altitude hydropower projects on the Indus have met with resistance from local Buddhist communities, who fear not only ecological disruption but the desecration of sacred landscapes. They have emphasized the fragility of their ecosystem, the loss of arable land, and the spiritual and cultural meanings embedded in their rivers and valleys.

Depending on their specific mode of operation, the environmental impacts of dams include fragmentation of riverine ecosystems, changes in flow patterns, modification of erosion and sedimentation processes, species extinction in freshwater and wildlife habitats, and loss of water by evaporation and contamination (Nüsser & Baghel, 2017). These impacts are particularly felt by riverine communities, whose livelihoods depend on agriculture and fishing. The destruction of fisheries and degradation of farmlands contribute to economic instability, while the loss of vernacular buildings and sacred places severs deep cultural ties.

The 2010 cloudburst exemplifies the vulnerability of these structures to extreme weather events. It is noted that the lack of planning (Mueller et al., 2019) and the rise in unregulated development exacerbate the risks to this fragile heritage (Le Masson, 2015). Structures built using traditional techniques may suffer great damage in the future. Monasteries and religious buildings are of particular concern, as many are already showing signs of deterioration and serve as central cultural institutions that support communities (Mueller et al., 2019). The case underscores the need for integrating climate data and traditional construction techniques in preservation efforts.

5.8.2 Miyama Village, Japan

Miyama, a preserved village in Kyoto Prefecture, exemplifies the harmonious integration of vernacular architecture with its natural setting. Traditional thatched-roof houses (*kayabuki*) were designed with sensitivity to seasonal flooding, snowmelt, and river overflows. However, post-war rural

depopulation and centrally planned hydraulic engineering projects, such as river straightening and the construction of flood control embankments along the Yura River (Kawai & Ashida, 2014), significantly altered groundwater levels and soil moisture.

In the late 1960s, a dam construction project in Ashiu, proposed by the Kansai Electric Power Company, was met with mixed reactions (Doshita, 2009). While many Miyama residents supported the project for its potential economic benefits, local communities in Ashiu and surrounding areas opposed it, prioritizing forest conservation over short-term development (Doshita, 2009). Protesters engaged urban allies by organizing hikes into the forest to raise awareness of the community's deep connection to the landscape (Doshita, 2009). This movement marked the beginning of the Ashiu hiking program (Doshita, 2009). By the late 1980s, local resistance had successfully protected the forest from dam construction (Doshita, 2009).

Despite the completion of the Ohno Dam upstream on the main river in 1961, flood safety in the region remained inadequate (Kawai & Ashida, 2014). In fact, in 2004, the area experienced its most severe flood since 1953, and this was surpassed in 2013 by another catastrophic flood that recorded the highest water level ever observed at Fukuchiyama (Kawai & Ashida, 2014).

Recognizing the environmental and cultural destruction caused by urban development, the concept of Satoyama was revitalized in Miyama at the end of the 1970s as a strategy for local renewal, following the abandonment of cultivated lands and widespread depopulation (Doshita, 2009). This movement sought to restore the reciprocal relationship between people and nature through sustainable land-use practices rooted in local tradition. By the late 1980s, tourism development began to take shape in Miyama, leveraging its vernacular architecture and preserved landscapes to attract visitors interested in ecological and cultural authenticity (Doshita, 2009). Although primarily constructed for flood control and hydro-electric power generation, the Ohno Dam has since become integrated into the local landscape. It now supports recreational use, with hiking trails and a multipurpose field surrounding the dam area (The Official Travel Guide Kyoto Miyama, n.d.).

Miyama has since responded with locally driven disaster risk management strategies. Communities have developed their own disaster mitigation maps and disaster risk management (DRM) plans (Global Facility for Disaster Reduction and Recovery & The World Bank, 2020). In addition, cultural practices have been adapted to support resilience; for example, fire extinguishers are tested annually during local festivals to prepare for future disasters (Sen, 2024). A new information system using mobile network to share alarms of fire outbreaks in a neighborhood was invented (patented) and tested by a pilot experiment in Sasayama city and Miyama area in Kyoto (Global Alliance of Disaster Research Institutes, n.d.)

Despite these pressures, Miyama has retained much of its forested landscape through rigorous forest management, land-use planning, and cultural

heritage policies. Supported by government rural revitalization programs, the village has balanced tourism with environmental protection and the preservation of traditional construction (Doshita, 2009). Rather than pursuing large-scale hydropower, Miyama has adopted a model of micro-hydropower generation. Community-managed water channels and small turbines allow the region to remain energy-resilient while safeguarding historic waterways, offering a sustainable alternative that respects both ecological systems and rural traditions.

5.8.3 Dogon Villages, Mali

The Dogon communities of Mali have historically settled along the Bandiagara Escarpment, favoring cliffs and upland areas to avoid flood-prone valleys. This choice of settlement not only provided physical security but also allowed for sustainable land use and the preservation of cultural practices deeply connected to the landscape (Bedaux et al., 1991; Gallais & Sidikou, 1978).

However, multiple pressures, both internal and external, have led to increasing environmental degradation across the Dogon Plateau. One of the pivotal shifts occurred in 1938, when onion farming was introduced following the construction of small-scale dams (*barrages*) (van Beek, 1993). These dams created artificial lakes that enabled cultivation in previously uncultivable areas (van Beek, 1993). While economically beneficial, this transformation marked the beginning of significant ecological stress, including desertification of the surrounding plains due to overcultivation and widespread deforestation (World Bank Group, 2012).

Dogon agriculture became increasingly intensive, centering on the *falaise* rim and outfields during the rainy season, and waterholes in the dry season (van Beek, 1993). This ecological intensification, coupled with population growth from approximately 100,000 in 1900 to over 300,000 by the early 1970s, placed considerable pressure on natural systems (van Beek, 1993). The rising demand for manure, driven by onion and tobacco farming, encouraged an increase in livestock populations, further stressing already fragile soil systems and disrupting the traditional *jachère* (fallow) cycle (van Beek, 1993).

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The severe droughts of the 1970s and 1980s further exacerbated land degradation, reducing vegetation cover, increasing erosion, and accelerating rural vulnerability (Craven-Matthews & Englebert, 2018). In response, international development programs introduced roads, irrigation systems, and agricultural interventions, often financed by foreign aid. While these projects aimed to modernize rural life, they also accelerated deforestation, undermined traditional practices, and initiated large-scale land-use changes that were not environmentally sustainable (World Bank Group, 2012).

Colonial and post-colonial development projects in Dogon villages often disregarded traditional architectural knowledge and topographic siting. The introduction of concrete and asphalt infrastructure, perceived as symbols of progress, led to increased erosion, overheating, and the gradual collapse of vernacular architecture specifically adapted to extreme aridity and seasonal flooding. As riverine ecosystems and cultural landscapes were replaced with modern materials and dense housing, environmental vulnerability significantly increased (Alatalo, 2019; Marchand, 2009).

These pressures are further compounded by recurrent droughts, food insecurity, socio-political instability, and climate-induced migration (Raineri, 2022). All of these challenge not only environmental resilience but also the preservation of Dogon cultural heritage. Traditional ecological knowledge, once integral to sustainable land management, is increasingly at risk. Poverty and lack of institutional support hinder conservation efforts (Alatalo, 2019).

Nevertheless, initiatives like the 2002 collaboration with the National Museum of Ethnology in Leiden, and the 2019 restoration efforts led by Partners Pays Dogon and LEVS Architecten, have highlighted the importance of community-driven projects (Alatalo, 2019). These initiatives emphasize participatory approaches and intergenerational knowledge transmission as key strategies for sustainable cultural and ecological restoration (Alatalo, 2019).

Moreover, Dogon communities have shown active resistance to top-down hydrological infrastructure projects along the Niger River and its tributaries.

These projects—often justified under the banner of development—threaten to submerge farmland and sacred sites, prompting strong local opposition. The resistance underscores the inseparability of environmental stewardship and cultural identity in the Dogon worldview, especially in relation to water, which holds spiritual and ecological significance.

5.9 Conclusion: Spatial Planning Decisions for Adapting Vernacular Landscapes to Climate Change

This case study analysis depends on the availability of data from the relevant stakeholders' databases: locations of heritage sites, floods, and landslide-prone areas. The challenge of gathering data and aerial pictures of high enough quality to effectively map the area was an obstacle for this research. Since available aerial images were mainly focused on the coastal area, few images beyond the coastline were available to map and analyze the hinterland where threatened historic buildings are located. In addition, data on contemporary disasters or changes in land use were inconsistent with the official sources of various institutions as these institutional sources were not accordingly overlapping, complementary, completed, or explained. Despite these limitations, maps produced from a diversity of sources provided a comprehensive picture of the current landslide risk to natural sites and vernacular settlements. Previous studies of the area have overlooked the disasters affecting vernacular heritage sites; thus, additional, thorough research needs to be conducted for this increasingly vulnerable area to identify the site-specific risks.

The accelerating rate and scale of deforestation and desertification in the district places additional pressures not only on the newly built facilities but also on the resilience of vernacular buildings. As emphasized earlier, the builders of vernacular houses more than 200 years ago planned their construction in line with the humidity and precipitation levels of the area and their knowledge of flood patterns. The result was that these structures are more resilient to natural hazards. The analysis of the maps reveals that three out of 58 of these vernacular buildings are currently located in disaster-prone areas and the homeowners are now left to deal with pre-and post-disaster situations.

Construction of the new buildings both in the flood-prone and landslide-prone areas has caused an increase in the number of hazards in Rize. The northern estuary of the two rivers studied is a good example, since public authorities allowed the urbanization of most of its land. This already vulnerable area has become densely populated as construction has continued up to the very edge of the river. Modifications to the rivers by public authorities (involving concretization and artificialization) did not consider the risks inherent to river flows in mountainous areas near the sea. Further incentives came from the construction of new roads and bridges along and across rivers, which is not only channeling the rivers but also placing obstacles in the riverbed. When heavy rainfall occurs, the decreasing forest cover results in more

frequent and severe landslides and river flows, creating violent flows that wash away materials and debris, which can easily clog rivers around bridges. These obstacles and blocked paths in turn increase water levels upstream, aggravating the flooding of newly built areas along rivers. By supporting the urban development of the coastal area and the settlement of buildings along the river, authorities are neglecting the effects of their modifications on the river flow rather than accepting that these areas could be dangerous.

Development-driven land clearance aggravates the occurrence and intensity of landslides. Maps and data from other resources show an overlap or closeness between deforested lands and landslides. The link to increasing floods is indirect but present considering the impacts of forests on the capture of water during rainfalls and its slow release into rivers. Forests contribute to the regulation of river flows in addition to preventing landslides (Phillips et al., 2025). Weak law enforcement has left the door open for illegal logging, which is likely to continue. It is particularly difficult to protect forests from illegal logging due to poor transportation networks. Considering the current state of the forests, development plans should include sustainable forest management in landslide-prone areas. The development projects and practices so far have little regard for the livelihoods of local communities and for the agricultural practices surrounding the natural resources that they are harvesting.

Regarding the analysis of the vulnerable heritage sites, results obtained from the assessment of vernacular heritage sites in Fındıklı reveal that three vernacular buildings are now exposed to the risks of landslides due to urbanization, deforestation, and modifications along rivers and coastal areas. Although the spatial data show that there are a few sites that are directly and indirectly affected by the landslides and flooding in this specific area, onsite observations and interviews further reveal the extent of damages on the vernacular sites. The ongoing decay and deterioration of vernacular heritage sites is likely to increase considering the unplanned spatial development decisions as a driving factor of climate change.

There are fundamental issues involved in overcoming the barriers, gaps, and challenges of safeguarding vernacular heritage, particularly in the case of Fındıklı in Rize. Data including geographical locations, character attributions, historical background, and past and present images should be correctly, consistently, and precisely documented. The heritage value of vernacular sites should be reassessed to prioritize the significant elements in times of climate crisis. Based on the studies on the site, the present and expected hazards should be identified and a database for hazard monitoring and mapping should be created through the use of GIS and/or remote sensing technology. As an integral part of cultural landscapes, vernacular heritage, along with natural heritage sites, should be included in mapping and monitoring plans. In addition, there is a need for creating awareness about cultural heritage in the context of disaster management among various stakeholders, including local communities. In addition, conservation plans should include potential risks and hazards and the susceptibility of vernacular sites to landslides and floods. The capacity of

structures to recover from these hazards can be determined as a result of such disaster risk management plans. For the future of these sites, it is critical to adapt vernacular heritage sites and their environment to the risks.

As one step toward protecting these vulnerable sites, following landslides, retaining walls were built at some of the vernacular sites in Fındıklı, although most of the buildings remain unprotected. There is a need for more construction of terraces around sites where landslides still pose risks. Control and management of the construction of new buildings, infrastructure, and tea plantations is needed to prevent further damage, while the objectives of policies should be reassessed. In addition, more consideration should be given to protecting forests and developing hinterland tourism in more sustainable ways. The contribution of local communities to reforestation is equally important. However, it is clear that public and private institutions at the regional and city scales cause the most environmental damage through deforestation and other activities. Collaboration between these groups and local communities in the implementation of policy to help protect vernacular structures is therefore critical to preserving and protecting these important sites for the future. Controlled and sustainable urban development with the careful management of natural resources can ensure long-term resilience. In addition, the narrowing of riverbeds increases flood risks, requiring drainage improvements. Identifying flood-prone and erosion-prone zones can guide reinforcement, riverine management, and infrastructure planning, while newly formed land requires careful zoning policies to prevent environmental instability in the midst of sea-level rise.

As such, the ongoing challenges of local communities since the 1950s in preserving their buildings play a significant role in understanding new exposures to the effects of climate change. Having become unfashionable and outdated since then, many people struggle with the maintenance of these historic homes and buildings. Local practices, including the interventions of building owners to their lands and buildings, may increase the vulnerabilities of the site. When incompatible with the characteristics of these buildings, these practices became examples of maladaptation in today's context. Hence, the challenges that local communities face should be considered in the strategies for climate and disaster risk management.

The cases of Leh-Ladakh, Miyama Village, and the Dogon Plateau collectively demonstrate how spatial planning decisions, especially those alienated from local ecological knowledge, can exacerbate environmental vulnerability in regions historically adapted to climate extremes. Across these diverse geographies, vernacular landscapes evolved over centuries through intimate engagement with topography, hydrology, and climate. Yet, post-1950s planning paradigms prioritized infrastructure development, economic growth, and modernization, often sidelining these time-tested spatial logics.

In Leh-Ladakh, for instance, construction in flood-prone areas and the alteration of traditional water channels magnified the damage caused by the 2010 cloudburst, while large-scale hydropower projects have triggered

both ecological degradation and cultural dislocation (Mueller et al., 2019; Nüsser & Baghel, 2017). In the Dogon region of Mali, the expansion of agriculture following dam construction and population growth led to desertification and soil depletion, while externally driven development programs eroded traditional architecture and hydrological practices (van Beek, 1993; World Bank Group, 2012). However, in Miyama, Japan, river straightening and small-scale dam construction did not seem to disrupt forest-water relations—though subsequent local resistance and revitalization movements have reclaimed much of the environmental and cultural integrity (Doshita, 2009; Kawai & Ashida, 2014).

These examples underscore a critical tension: while spatial planning is necessary for development and disaster risk management, it must be recalibrated to respect vernacular intelligence embedded in settlement patterns, architectural forms, and land-use practices. Rather than viewing indigenous systems as outdated, planners should integrate them with contemporary climate data and participatory tools.

Adapting to climate change, therefore, requires more than technical solutions—it demands a recognition of vernacular landscapes as dynamic systems shaped by lived experience, ecological feedback, and historical knowledge. Supporting local governance, enabling community participation, and investing in the preservation of vernacular practices are not just conservation goals—they are essential strategies for climate resilience.

Notes

1 The government design project of "Room for the river" in the Netherlands aims to provide more space for the rivers to manage the floods
2 Muhammet Kacar and Aytekin Kalender, "Denizi Kara, Karayı Para' Yaptılar Ama Önemli Uyarı Geldi: Binalar Kendiliğinden Çökebilir," Karadenizisyandadir, http://karadenizisyandadir.net/denizi-kara-karayi-para-yaptilar/.
3 Muhammet Kacar and Aytekin Kalender, "Denizi Kara, Karayı Para' Yaptılar Ama Önemli Uyarı Geldi: Binalar Kendiliğinden Çökebilir," Karadenizisyandadir, http://karadenizisyandadir.net/denizi-kara-karayi-para-yaptilar/.
4 Muhammet Kacar and Aytekin Kalender, "Denizi Kara, Karayı Para' Yaptılar Ama Önemli Uyarı Geldi: Binalar Kendiliğinden Çökebilir," Karadenizisyandadir, http://karadenizisyandadir.net/denizi-kara-karayi-para-yaptilar/.

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6 The Local Challenges of Preserving Vernacular Buildings

Perspectives of Building Owners (1950–2019) and Comparative Case Studies

6.1 Evolving Lifestyles in the Hinterland: Socio-Economic Shifts and Their Impact on Vernacular Heritage

Transformations in the socio-economic structure and local identities, such as the shift from manual labor to mechanized processes, have not only affected the use and maintenance of vernacular buildings but have also heightened the vulnerability of these structures to climate change. As vernacular buildings, initially designed to cope with local climatic conditions, are altered without regard to new climate realities, their resilience to extreme weather conditions, such as heavy rainfall, heat waves, and temperature fluctuations, diminishes.

Prior to the 1950s, the widespread economic activity of the rural population in Rize was mainly focused on animal husbandry. From spring to summer, local residents would travel to high mountain pastures with their herds of livestock, returning to their villages in the autumn. In 1950, job opportunities in the area increased and diversified due to the establishment of tea factories, and the opening of roads between urban and rural areas spurred rural-urban migration. Agricultural technologies on farms also began to become increasingly prevalent starting in the 1960s, reaching today's level of mechanization, irrigation, and substantial use of chemical fertilizer (Tanrivermis & Bulbul, 2007). In the 1980s, agricultural policies became unfavorable to livestock production, so this practice was replaced with crop production of hazelnut and tea (Somuncu, 2016).

As natural resources were depleted, many people left the villages for cities in search of jobs. This migration trend was especially prevalent among the youth population, who struggled to envision a life in the hinterland where employment opportunities were on the decline and income sources lacked diversity.

The changes in the socio-economic and social structure of the district due to globalization and national agricultural objectives and strategies have affected the spatial planning of the vernacular landscape, and along with it, the local identity. Most significantly, the prevalence of manual labor, which bolstered the creation of local furnishings, necessitated cable car transportation between the mountains, but later lost its significance in these geographically

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challenging sites. These elements of vernacular landscapes relying on the manual labor of agricultural activities were no longer in demand, and the relics of this past time left unused. As a creation of the pre-industrial period, vernacular landscapes no longer corresponded to modern industries.

Mechanization replaced the handmade production of furnishings, objects, and goods with consumerism via the use of engines. For instance, people used to make molasses in self-made wooden pots, but now mass production of molasses decreased the demand for its manual production. The usage of storage houses ended with the advent of refrigerators in the villages. While these advancements transformed rural communities into contemporary societies, traditional practices, along with objects, furnishings, and settlements, were abandoned by the local people. Globalization destroyed many local jobs as well as local identities.

Local people used to be self-sufficient. For example, S.Ş.'s parents only brought sugar and water from outside the district. Y.Y. confirmed that "in the old houses, people did not buy anything – they made all their furniture, cupboards, etc., excluding glass" (Y.Y. Çağlayan, January 11, 2019). With the adoption of modern lifestyles, industrial manufacturing replaced home production. Technological advances transformed woodworking from a manual craft into a mechanized process. Although production increased, the economic benefits of commercialization did not grow at the same pace. Consequently, this shift has disrupted the circular nature of traditional architecture and weakened the communities' self-reliance in building and maintaining it.

In addition to wood, changes resulting from modernization and industrialization could be witnessed across other materials. Instead of the stone steps that were historically installed to climb the steep terrains, people now built roads to their properties for more convenient access. As tea income became established as the primary source of revenue, tea field shacks continued to be used. As a result, many components of this vernacular landscape have since been either replaced by modern structures or left to decay. These patterns of behavior reveal the evolution of the need and appeal toward modern comfort and the economic burden that preservation entails.

In the face of this changing landscape, vernacular building owners refurbished their buildings according to their needs and lifestyles by adding extra rooms, dividing rooms, and/or changing the function of the rooms (Figure 6.1). While the restoration of vernacular buildings derives from necessity, some of these contemporary interventions led to issues such as thermal discomfort, the disintegration of construction and materials, incompatible replications, and value loss. The old kitchen, living room, and toilets were no longer functional due to the introduction of new appliances. Storage houses, barns, and storage cabinets became unused due to the abandonment of agricultural activities. The concrete addition of rooms and floors not only resulted in disproportionate scales of these buildings but also decreased their resilience to micro- and macro-climates. The additions and interventions

Figure 6.1 In Sulak Village, it is common to see modern additions built alongside traditional stone-infilled timber structures. This example highlights the stark contrast between the original building and the latest constructed extension. Photograph by the author on July 7, 2019.

made by the next generation of homeowners made these buildings even more vulnerable to the changing climate.

The reasons behind the deterioration of the buildings, mainly from issues brought by this industrialization, are explained in detail through the analysis of interviews with local people in the following sections. In addition, the analysis of the interrelations between these reasons reveals some of the continuous challenges of the preservation of the vernacular settlements globally that persist today. Some of these obstacles are more prominent than others in local practices at the community level.

6.1.1 Conflicts among Multiple Heirs

Cultural heritage acts as a shared resource among many local residents as the ownership of vernacular properties passes from generation to generation. As the social structure in the area consists of large families, there are often multiple heirs to a single property. This often creates issues in the ownership of the land and the houses, leading to questions such as, who owns the property,

and if there are multiple heirs, how many people have a claim to it? Even if equally divided, these family-owned properties can lead to disputes among the shareholders. For example, not every shareholder holds the same views on maintaining the property. Even though mentioned by only few local people (n=3), it seems that there is a belief that there are too many shareholders and disputes among families over the management of these sites. The conflicts are often resolved by simply leaving the property to its fate, which ultimately results in decay. Because the heirs cannot resolve the issues of ownership and maintenance of the property, such as whether to invest in renovations and repairs to keep it as a family residence, to sell the property, or to rent it for vacation bed-and-breakfast stays. Considering the interior of the home was adapted to the period of its construction, even if previous generations have renovated it, it often does not reflect the needs and styles of modern life.

While abandonment of the property may seem like the easiest way out, it results in economic loss, considering the current market value of these heritage properties. H.Ş. gives an example of this barrier by stating that:

> We did not divide the house among shareholders, I built a new house at the bottom, but I renovated it here too… For example, three brothers, who are shareholders, did not care about the old house [in a property in Çağlayan village], they conflicted, and each constructed a concrete building. This [old] house was left to decay.
>
> (H.Ş. Çağlayan, personal communication, June 30, 2019)

Similarly, Y.G. claimed that while their house is not shared, there are houses with many shareholders (Y.G. Çağlayan, personal communication, July 5, 2019). In some cases, when one of the shareholders can afford the restoration of the vernacular building and wants to buy out the others, the remaining shareholders find themselves being forced out and rarely want to sell their shares. As the economic value of the building, and with it, the site, increases drastically with its renovation, the shareholders seek to retain their shares for future investments. This entails a mutual agreement between the heirs to determine the ownership of the house and, most importantly, the investments in it for better management of the site, as pointed out by the interviewees. The fact that this problem occurs not only in the villages but also in the larger region reveals the scale of the issue. Observations in nearby cities highlight the extent to which heirs of even large mansions abandon their properties because of similar disagreements. In some cases, the issue is resolved by giving ownership to one heir who has the funds to restore the property.

6.1.2 Abandonment

Abandonment is the second most reported challenge with eleven mentions (n=6). Since the 1950s, the depopulation of rural areas has been a growing

concern. H.Ş. observed that "as the young generation got more educated, they left here for the cities, and more land became available" (Çağlayan, personal communication, June 30, 2019). "When grandmother died, there was no chance to preserve the house, so it decayed," said Ş.S. (Fındıklı, personal communication, January 14, 2019), echoing the sentiments of H.Ş. The next generation left for bigger cities and better opportunities, as they did not appreciate rural life and its buildings until very recently. A reverse trend was observed in the late 2000s with an increasing awareness of slow and sustainable living. Living in the villages, growing crops, and manual labor became trendy again in the face of the challenges brought by globalization.

Such historic buildings tend to survive as long as they are occupied. Y.Y. testifies that the unoccupied houses are deteriorating faster (Y.Y. Çağlayan, January 11, 2019). This disinvestment and disuse lead to neglect of the site, which is slowly integrated with its surroundings and overtaken by the surrounding greenery. Ultimately, nature reclaims the building, and it starts to slowly decline, eventually becoming a ruin. If there are residents, the buildings will survive through continuous adjustments, repairs, and renovations. However, this upkeep is difficult if the occupants do not have the knowledge or skills to do the proper maintenance of these buildings.

The city's promoted heritage sites are often grand mansions, named after their original owners, typically denoted as "the son of someone" (names anonymized), reflecting a legacy tied to status and identity. In contrast, the vernacular houses scattered across the villages remain largely anonymous, despite bearing clear traces of past lives lived within them. Though abandoned and overlooked, these homes still exhibit intricate wood carvings, stonework, ornamented entrances, and built-in wooden cabinets, elements that are often concealed behind modern furnishings in still-occupied houses. In one instance, a family constructed a new home adjacent to their old, abandoned house, watching its gradual decay unfold from their balcony. This passive witnessing of deterioration reflects a broader tendency in the area to let such buildings fade away. These ruins, unlike restored heritage sites, carry an emotional weight, connected more to memory and loss than pride and preservation. Left exposed to the elements, they slowly collapse as roof tiles, siding, flooring, and interior finishes rot and erode. The prohibitively high cost of restoration often renders structural rehabilitation unfeasible for buildings deemed low in economic value, despite their considerable cultural significance.

6.1.3 Erosion of Traditional Building Knowledge and Practices

The loss of traditional building knowledge and practices was rarely reported by local residents (n=3). However, the gradual erosion of collective memory, cultural identity, and the vernacular way of living, settling, and constructing has led to the destruction of vernacular heritage. Contributing to this decline are the closure of local quarries, the disappearance of skilled stonemasons

and timber artisans, and the rising costs of materials and construction. These factors have collectively hindered the preservation and continuation of traditional building practices.

Abandonment of vernacular buildings has further disrupted the transmission and protection of traditional knowledge and construction techniques to younger generations. Over time, local communities have forgotten the essential skills related to land management, material sourcing, and construction methods. The shortage of traditional artisanship has made it difficult for current building owners to initiate restoration projects compatible with original architectural forms.

Moreover, traditional knowledge has not been passed down effectively, as many heirs of these properties have opted to build and live in new, modern structures. When returning to their ancestral homes in the 2000s, they lacked the skills and knowledge needed to restore them authentically. Compounding the problem, national regulations had by then designated forests and rivers as protected natural resources, prohibiting the extraction of chestnut timber and river stones, materials essential for vernacular construction.

Specifically, the Ministry of Agriculture and Forestry designated forests as natural heritage in the 1950s to combat deforestation and preserve biodiversity. Similarly, the General Directorate for the Protection of Natural Assets under the Ministry of Environment, Urbanization, and Climate Change recognized rivers as protected natural features. These policies, although environmentally motivated, restricted local access to critical construction resources. In addition, the size and quality of available timber in forests no longer meet the structural requirements for traditional buildings. This has led to the adoption of alternative materials like zinc for roofing instead of traditional roof construction materials known as *hartama*, which consists of wide and long timber slabs made of Ladin tree (Sümerkan, 2008).

The decline in traditional know-how not only reduces the historical value of the buildings but also compromises their structural integrity and thermal performance. For instance, residents who lived in concrete annexes report poor insulation, resulting in cold and damp interiors during winter. Yet, untouched traditional buildings often fail to meet modern comfort standards, which has been cited as a drawback by local communities.

Lastly, when buildings are left in the care of *yarıcı*, seasonal workers entitled to half the tea harveststhey often deteriorate more rapidly due to a lack of proper maintenance. These socio-economic and environmental constraints continue to threaten the sustainability and relevance of vernacular architecture in the region.

6.1.4 Raising Awareness

The most well-preserved vernacular buildings are often those officially designated and protected by public conservation institutions. However, effective preservation is not solely dependent on institutional intervention or financial resources—it also relies heavily on the awareness and initiative of the

homeowners themselves. In several cases, buildings have been maintained thanks to the personal commitment of their occupants, who recognize the historical value of their homes.

This lack of awareness, rather than funding alone, was identified by some interviewees as a key factor in maladaptation. A few respondents (n=2) emphasized that preservation is closely tied to emotional attachment and nostalgia. As one noted, "the homeowners will preserve their houses if they give value to nostalgia" (C.K. Hara, July 3, 2019). A homeowner who both values heritage and has the means to act upon it is more likely to maintain their property. According to H.Ş., awareness of the importance of these buildings has only emerged in the last decade: "until 10 years ago people have not paid attention to these buildings" (H.Ş. Çağlayan, personal communication, June 30, 2019).

In the past, many locals viewed these buildings as burdens due to the lack of modern amenities, high maintenance costs, and problems such as insect and scorpion infestations (F.H. Çağlayan, personal communication, January 12, 2019). Without addressing these challenges, homeowners often feel discouraged from maintaining their properties.

Owner-occupied buildings tend to endure longer as their occupants are more likely to appreciate and invest in their historical value. As Y.Y. puts it, "after the people (the occupants) are gone, they (the historic buildings) disappear" (Y.Y. Çağlayan, January 11, 2019). Today, however, there is growing awareness not only of their cultural importance but also their economic potential. Adaptive reuse of these homes can generate income while simultaneously fostering intergenerational knowledge transfer and heritage appreciation.

Some residents have revived traditional practices by reusing these buildings, which has attracted increasing interest from tourists. These heritage structures are promoted through brochures distributed in Fındıklı's city center. Given the scarcity of hotels in the area, these guest houses have become particularly appealing. For instance, one night's stay—including the experience of traditional food served beneath storage buildings—can cost as much as 1,000 TL in 2019 (approximately 65.45 euros). In one notable example, a homeowner has transformed their building into an open museum, allowing younger generations to engage with forgotten customs and historical artifacts.

The official listing of these buildings by public institutions has further elevated their significance and encouraged efforts to safeguard them. By combining cultural awareness, adaptive reuse, and formal recognition, communities are finding sustainable pathways to preserve their vernacular heritage.

6.1.5 The Role of Listed Buildings

In Türkiye, the conservation of cultural heritage is governed by Law No. 2863, enacted on July 21, 1983, titled the Law for the Protection of Cultural and Natural Assets, known as *Kültür ve Tabiat Varlıklarını Koruma Kanunu*. Under this legal framework and the authority of the Ministry of Culture and

Tourism, the Regional Board Directorate for the Preservation of Cultural Assets in Trabzon (Trabzon Kültür Varlıklarını Koruma Bölge Kurulu) evaluates and lists vernacular buildings according to their conservation status.

The report refers to a previously given decision on the listing of a vernacular house in Sümer Village in 2012. Even though the report mentioned the storage house in the decision of the listing of the vernacular building, the report did not include the storage house in the listing itself. According to the letter, it is now included in the listing.

The classification of buildings is based on the degree of preservation required:

- First-degree conservation sites must retain their original architectural form, both interior and exterior, and are subject to strict preservation rules. These typically include large mansions or historically significant structures.
- Second-degree listed buildings, which often comprise traditional village houses, allow for interior modifications while preserving the exterior.
- Third-degree sites are subject to fewer restrictions and allow for greater flexibility in renovation and development (Eres, 2016).

Homeowners of vernacular buildings may voluntarily apply for their properties to be listed, thereby becoming eligible for government restoration funding. The application requires submission of documentation regarding the building and its surroundings. However, if a building is not officially listed, owners are not legally bound to protect it, and its destruction or alteration is not penalized (Eres, 2016).

As stated by Y.Y., only 20–30 buildings were listed in Fındıklı in earlier years, but that number has since grown to approximately 100 (Y.Y. Çağlayan, January 11, 2019). This increase is partly due to the rising interest in rural tourism, encompassing highland retreats, natural landscapes, and cultural heritage routes. Some property owners, such as S.Ş. and B.U., have adapted their buildings for guest accommodation, offering bed-and-breakfast services and heritage tours. Listed buildings are restored according to legal guidelines, whereas non-listed ones—especially those with second-degree status—often undergo more substantial internal renovations.

Despite the legal provisions, awareness and understanding of a building's listing status vary. Among five interviewees, only two could confidently explain the heritage classification of their homes, while one was unaware of their building's status. For example, H.Ş. identified his house as either first- or second-degree protected (H.Ş. Çağlayan, personal communication, June 30, 2019), and S.T. explained that his house was listed due to its well-maintained condition (S.T. personal communication, Gürsu, July 2, 2019). In contrast, C.K.'s home was not designated due to significant alterations made by family members, which compromised its authenticity. These cases illustrate that conservation decisions, and eligibility for public funds, are largely shaped by past maintenance and preservation practices.

However, the listing process itself can deter homeowners from applying. The restrictions imposed by the law, especially on first- and second-degree buildings, are often viewed as too stringent. F.H. explained her hesitation:

> When you apply for it [a listing of the property], you cannot get around, you cannot renovate as you please. You will have to follow the strict guidelines, we did not want it.
>
> (F.H. Çağlayan, personal communication, January 12, 2019)

For second-degree listed properties, owners may renovate the interior, but the exterior must remain faithful to the original appearance, based on historic photographs, plans, sketches, or written descriptions. These references often exist only in private family archives. H.Ş. noted the challenges this creates:

> According to the restrictions of the listed buildings, we can renovate the interior but the renovation of the exterior façade was done according to their guidelines, including the roof and its surroundings.
>
> (H.Ş. Çağlayan, personal communication, June 30, 2019)

In some cases, the insistence on restoring a building to its "original" form is problematic, especially when that state is based on renovations from the early 1900s rather than the initial construction. It is often unrealistic to expect contemporary inhabitants to live with outdated features like single-glazed windows or soil flooring in the living room. Moreover, legally listed homes cannot be sold or altered without state approval, further limiting ownership autonomy. As H.Ş. explained:

"The house, which is registered, cannot be sold or damaged" (H.Ş. Çağlayan, personal communication, June 30, 2019) because it is under the management of the public institution. Listing the alterations at his house, he claimed:

> We renovated it according to its original state 200 years ago. For example, this place was closed [referring to a previously enclosed area]. I requested it to be opened and they did it. Sash windows are the same as the original. My mother had it done before. The architect accepted one window [in the corner] as it is. I could not cancel it. It is not symmetrical, it stands alone.
>
> (H.Ş. Çağlayan, June 30, 2019)

While some owners accept these rules as necessary for authenticity, they also express frustration over rigid regulations. T.H., for instance, emphasized a balanced approach:

> Buy a single sash window! You will not ruin the original look. They let me do this. Other than that, I also do not want to do any artificial changes.
>
> (T.H. Gürsu, July 2, 2019)

Ultimately, the stringent requirements associated with official listing often discourage residents from seeking public support. Though such funds aim to aid in conservation, they are seen as burdensome due to the constraints they impose. In some cases, unlisted buildings are renovated more affordably and flexibly, suggesting that the current system may inadvertently hinder preservation by making legal compliance less appealing to local communities.

6.1.6 Financial Burden of Maintenance

Maintenance costs and running costs, such as renovations, repairs, and energy saving, emerged as the most cited challenges in the interviews (n=8). Restoring these traditional vernacular houses is particularly expensive due to the scarcity of original construction materials and the loss of traditional construction techniques. Significant financial resources are required to hire skilled craftspeople and acquire appropriate materials.

Ş.S., a skilled artisan who works on a contractual basis, highlighted the financial difficulties faced by homeowners. He explained that in roughly 80 percent of the projects, the homeowners are responsible for covering the cost of construction materials, which is why he excludes material costs from his price estimates (Ş.S. Fındıklı, January 14, 2019).

Despite the increasing use of modern materials like concrete and briquettes,[1] some local residents have made considerable efforts to preserve the authenticity of their homes. However, this often leads to additional expenses related to removing incompatible materials and structural extensions. For instance, S.T. discussed the high cost of renovating a toilet:

> It was built with briquette. The cost of renovating the toilet included two different expenses because the stone façade was renewed on the exterior, whereas the interior was refurbished.
>
> (S.T. Gürsu, personal communication, July 2, 2019)

While affluent homeowners, such as those in the village of Çağlayan, are able to restore their grand mansions, many villagers live in deteriorating houses they cannot afford to maintain. As Y.Y. observed:

> They have left their mansions but saved a budget to restore their mansions. But the small-sized houses of the poor local people collapsed onto their heads. Because of the convenience of the use of concrete, people abandoned those houses.
>
> (Y.Y. Çağlayan, personal communication, January 11, 2019)

He elaborated further on the prohibitive costs:

> One cubic meter chestnut tree or three meters of pine tree cost 700–800 Turkish Liras [at the time of writing, this is approximately 70–80

> euros]. One ordinary person can't build 100 square meters. Labor and materials are expensive.
>
> (Y.Y. Çağlayan, personal communication, January 11, 2019)

The devaluation of the Turkish Lira has exacerbated construction costs. In line with the statements of Y.Y., Y.G. added "they sell one stone for 12 to 15 Turkish Liras" (Y.G. Çağlayan, personal communication, July 5, 2019).

Similarly, Ş.Ö. estimated:

> It will cost 15 million lira for our children to live with us.
>
> (Ş.Ö. Çağlayan, personal communication, July 6, 2019)

This cost reflects the need to renovate the entire building to accommodate the interviewee's family.

Although government incentives for listed buildings offer some financial relief, they come with restrictive conditions that many locals find burdensome. The support often falls short, failing even to cover essential repairs like roof restoration, a critical defense against rain-induced decay. As a result, many residents question the benefit of listing their properties. For instance, F.H. remarked that the cost of the complete renovation of her house was "estimated at 500 thousand Turkish Liras (32 thousand euro)" (F.H. Çağlayan, personal communication, January 12, 2019).

She further explains that "the government provides 90,000 out of 500,000 and the homeowner has to cover the rest" (F.H. Çağlayan, personal communication, January 12, 2019). This means homeowners receive less than one-fifth of the required funding, leading many, like Ş.Ö., to avoid listing their properties altogether in order to retain flexibility over modifications.

Rising labor costs have also led to the replacement of traditional woodworking with cheaper alternatives. Preserving traditional practices is increasingly difficult, as it requires finding skilled masters who can offer both affordable labor and authentic materials. Ş.S., the stonemason, detailed current material sourcing practices:

> We cannot get anything from the forests anymore. We rely on material from the timber merchants, lumber people. They obtain it from the forestry. They cut the auctioned trees in the big workshops legally not like the illegal practices of the past. We use the cut timber in house construction. We usually buy logs and cut them to suit our needs.
>
> (Ş.S. Fındıklı, personal communication, January 14, 2019)

The unavailability of traditional materials not only hampers accurate restoration but also complicates efforts to improve energy efficiency in these

buildings. Nevertheless, there is growing interest in integrating sustainable technologies, such as by installing solar panels. G.A. mentioned:

> They said that we would receive energy from the sun in the case we want to do all the restoration.
>
> (G.A. Hara, personal communication, July 3, 2019)

Despite this interest, the high cost of installing renewable energy options such as solar panels limits their feasibility for most locals. Ultimately, residents link these challenges to a lack of institutional support, both in terms of preservation policy enforcement and financial subsidies. While it is essential to do the necessary preventive maintenance work on vernacular buildings, it is also necessary to consider long-term dynamic maintenance plans. Any future maintenance strategies should adopt a cultural landscape perspective, integrating cultural and natural values to ensure resilient, sustainable solutions for vernacular environments.

6.1.7 Insufficient Institutional Support

The existing laws and policies regulating cultural and natural heritage preservation are often conflicting. For example, in 2008, the Trabzon cultural and natural heritage preservation board designated Çağlayan valley a first-degree and Arılı valley a first- and third-degree natural heritage sites in Fındıklı following the opposition of local communities to the construction of a hydroelectric power plant.[2] While these designations were intended to protect rivers and forests, they also restricted local communities from collecting natural building materials. Ironically, these same lands were sold by the state to large corporations, prompting frustration among residents. Y.Y. criticized this hypocrisy, noting that the Ministry of Forestry continues to auction off forest land, enabling its exploitation and destruction:

> The Ministry of Forestry sells the forest lands at auction and lets them be destroyed.
>
> (Y.Y. Çağlayan, personal communication, January 11, 2019)

Trees once abundant in the region, like chestnut and juniper, which were historically used in water mills and storehouses, have become rare. Y.Y. lamented the undervaluation of high-quality timber and the abandonment of traditional woodworking, driven in part by flawed forest management practices (Y.Y. Çağlayan, personal communication, January 11, 2019). Despite environmental laws meant to protect, the over-extraction of resources and poor enforcement have led to irreversible losses in both natural and cultural heritage. More fundamentally, it has become clear that manufacturing

processes have effectively caused the abandonment of traditional woodworking. Even when confronted with the destruction of the natural environment, no amount of law enforcement seems able to prevent the loss of resources.

In response to the misuse of natural resources, government ministries have tightened their control over forest and river management. Individuals are no longer permitted to cut trees, a restriction that Y.Y. acknowledged had some positive outcomes:

> With the EU-funded program [as mentioned above], there was an increasing awareness of cultural heritage. At the time, the number of listed buildings was around 20–30 and today it has risen to 100, and now people construct new buildings using this stone-infilling technique. In other regions, such as the Aegean region, the builders construct these types of houses. Most of these houses are transferable and are handed over several times to different owners.
>
> (Y.Y. Çağlayan, personal communication, January 11, 2019)

While public awareness has grown, institutional support remains insufficient. Ş.S. argued that the Public Education Centre in Fındıklı should play a stronger role in promoting traditional practices but lacks formal backing:

> It is not supported by any bureaucratic or official institutes.
>
> (Ş.S. Fındıklı, personal communication, January 14, 2019)

Both Y.Y. and Ş.S. pointed to barriers, such as inadequate financial incentives and limited access to education (Ş.S. Fındıklı, personal communication, January 14, 2019; Y.Y. Çağlayan, January 11, 2019). Local, regional, and national organizations could serve as effective platforms for vocational training in traditional crafts, yet their potential remains largely unrealized.

A notable exception came in 2008, when the Fındıklı Public Education Centre partnered with the Faculty of Architecture at the Black Sea Technical University to launch the project *Training Masters for Rural Built Heritage in the Eastern Black Sea Region*. This initiative included 80 hours of theoretical instruction and 200 hours of hands-on training over 40 days. Participants first applied their skills to rebuild a stone-arched bridge in Derbent village. They then collaborated on constructing a public meeting place, a stone-infilled timber café, an example that successfully demonstrated the value of community-led projects.

The café project prompted local decision-makers to recognize the significance of community participation in heritage conservation. Inspired by this success, new initiatives, such as school construction led by non-governmental organizations (NGOs) and universities, began to emerge, involving artisans, women, students, and other community members.

The master-apprentice model remains a cornerstone of preserving traditional artisanship. Ş.S., who also served as an instructor in the training program, urged his colleagues to participate in the courses. The initiative resulted in a series of publications, documentaries, and advertisements helping to raise awareness and guide homeowners in restoring their properties with respect to traditional techniques.

Despite the positive outcomes of such programs, their sustainability remains a concern. Isolated projects alone are not enough. Without continued institutional backing, the momentum often stalls. Some craftspeople, disheartened by the lack of local administrative support, have ceased teaching or demonstrating their skills. Long-term preservation of living heritage depends on sustained collaboration between elder artisans, young learners, academics, and policymakers. Only through these coordinated efforts can the tradition of woodworking, and the broader cultural heritage it represents, be meaningfully safeguarded.

6.1.8 Generational Shifts in Vernacular Building Usage and Preservation

Local people (n=11) reported that renovations have been undertaken across multiple generations, with some buildings undergoing as many as six to eight renovations since their original construction. While the exteriors of many second-degree listed buildings remain relatively unchanged due to heritage protection regulations, their interiors have often undergone substantial transformations. In contrast, non-listed buildings tend to experience more extensive alterations, including expansions made with incompatible materials and aesthetics. Additionally, a proliferation of replica structures has emerged in the region, modern apartment buildings constructed to imitate the vernacular image of the district, often for commercial purposes.

Contemporary construction materials and methods have significantly altered the original appearance and spatial organization of these traditional buildings. Alongside changes to facades, substantial modifications have been made to the interior layouts and functions. A notable example is the reconfiguration of toilets: spaces once positioned opposite the main entrance are frequently converted into different rooms or fully modernized with new facilities. In some abandoned buildings, traditional clay plasters have deteriorated over time and become detached from the walls.

Key modifications include changes to roofing materials and interior elements such as walls and flooring. As T.H. recalled:

> I bought 1,500 tiles 10 or 15 years ago, but it still penetrates the water.
> (T.H. Gürsu, personal communication, July 2, 2019)

Modern interventions also include the replacement of single-glazed windows with double-glazed ones. In another case, H.Ş. lowered the living room floor to

accommodate updated spatial needs (H.Ş. Çağlayan, personal communication, June 30, 2019). F.H. described the sequence of renovations typically undertaken:

> When you first renovate this house, you will start from the roof. It won't rain inside the house. After that, you need to renovate the windows and then implementation of electrical wiring.
>
> (F.H. Çağlayan, personal communication, January 12, 2019)

As the average family size has decreased, so too has the need for multiple rooms. Simultaneously, the incorporation of kitchen facilities, such as sinks, refrigerators, and ovens, has led to a reorganization of domestic space. Traditional timber cabinets, once used for storage, are often removed, while electrical systems are installed and walls are repainted. Fireplaces have been sealed off and storage features are left unused. The buildings, as a result, no longer serve their original functions.

In response to contemporary needs, new architectural elements have emerged. These include verandas and the conversion of former storage buildings into pergolas for gatherings and social events. While these adaptations reflect changing lifestyles and generational preferences, they also underscore the persistent challenges associated with maintaining these heritage structures.

Occupant behavior plays a critical role in the ongoing maintenance of vernacular buildings. Promoting awareness and appreciation of vernacular landscapes is therefore essential to ensuring their sustainable preservation. Intergenerational engagement and education are key components in fostering long-term stewardship of these culturally significant environments.

6.2 Comparative Analysis

These challenges are not unique to Rize. Comparable socio-economic transitions have shaped vernacular landscapes elsewhere in the world. In Leh-Ladakh, high-altitude villages traditionally dependent on transhumance and barley cultivation are now seeing youth migration to urban areas due to declining agricultural profitability and climate-related water scarcity. Mechanization, along with the shift to tourism-based economies, has changed construction practices. Traditional earthen buildings, well-suited to the extreme desert climate, are being replaced with concrete structures that lack thermal efficiency and disrupt the visual harmony of the settlements. Similarly to Rize, where handmade furnishings and architectural features were left behind, Leh's traditional knowledge of rammed-earth and stone masonry is being lost as younger generations adopt standardized, modern materials.

This disintegration of vernacular lifeways due to industrialization is mirrored in Miyama Village, Japan, where mechanization of agriculture and rural depopulation led to the abandonment of traditional *kayabuki* (thatched roof) houses. However, unlike in Rize or Leh, local efforts in Miyama

sought to reintegrate cultural tourism and vernacular conservation into the economy. Community initiatives encouraged the adaptive reuse of homes as guesthouses and cafés, helping to sustain traditional craft practices such as thatching and carpentry. These efforts show that while socio-economic changes may erode traditional forms of life, they can also stimulate innovative conservation strategies if supported by community-driven planning.

A different but equally telling example comes from the Dogon Villages of Mali, where traditional architecture, often built from earth and adapted to arid conditions, is endangered by socio-economic changes and modern pressures. Increasing desertification, the spread of concrete block housing, and youth migration to urban areas have weakened local transmission of building knowledge. Like in Rize, Dogon communities once practiced circular economies of self-built structures using local materials. As those practices fade, vernacular buildings are either left to deteriorate or replaced by ill-suited materials that compromise climatic adaptability.

6.3 Leh-Ladakh

In Leh-Ladakh, joint family ownership of *gonpa-style* homesteads, which are typically Buddhist spiritual compounds, and traditional mud houses similarly leads to preservation challenges (Sharma, 2020). As family members migrate to urban centers, absentee ownership becomes a growing problem. Disagreements over investment responsibilities often result in the abandonment of these properties. In some villages, sections of ancient houses collapse while distant heirs deliberate over legal rights and inheritance shares. The cold desert climate exacerbates deterioration, while local building knowledge continues to decline.

6.3.1 Migration and Abandonment of Traditional Homes

A key issue facing Leh-Ladakh is the migration of younger generations to urban centers in search of better economic opportunities. As family members move away, often to cities like Delhi or Mumbai, absentee ownership becomes a growing problem for many traditional homes (Alexander, 2005). Abandoned houses, particularly in rural villages, are vulnerable to collapse, exacerbated by the harsh desert climate (Alexander, 2005). The cold winters accelerate the deterioration of these earthen structures, especially when they are unoccupied and lack regular maintenance.

6.3.2 Decline of Traditional Building Knowledge

The erosion of traditional building knowledge is another critical concern. Earthen construction techniques, once passed down through generations of Ladakhi artisans, are rapidly vanishing (Phunsog et al., 2020). As younger Ladakhis are increasingly educated in cities, they often lack the familiarity or interest in

maintaining traditional mud-brick construction. Consequently, newer buildings are often made of concrete and steel, materials that are durable but poorly suited to the region's extreme climatic conditions (Diwan & Kumar, 2024).

6.3.3 Adaptive Reuse and Tourism

Despite these challenges, there is growing recognition of the cultural and economic potential of traditional architecture in the tourism sector. As visitors seek more authentic and sustainable travel experiences, several vernacular buildings are being repurposed as guesthouses, museums, or cultural centers (Harrison, 2014). These adaptive reuse projects have raised awareness of the need to preserve Ladakh's architectural heritage (Harrison, 2014). However, the absence of a robust heritage protection framework remains a critical barrier. Many of these homes are not officially listed or regulated, leaving them vulnerable to unregulated restoration or demolition (Harrison, 2014).

6.3.4 Financial Pressures and Material Scarcity

Restoration and preservation require substantial financial investment, especially given the declining availability of traditional materials like timber and mud (Ferrari, 2018). The isolation of the region means that sourcing these materials has become increasingly expensive, pushing homeowners toward concrete and other modern alternatives (Diwan & Kumar, 2024). Although concrete may reduce short-term costs, it compromises the integrity and environmental compatibility of traditional structures.

6.3.5 Generational Shifts and Changing Needs

As in many rural regions, Leh-Ladakh has experienced a generational shift in values and lifestyle preferences. Traditional mud-brick houses, once well-adapted to communal living and environmental conditions, are being replaced by modern structures with amenities like indoor plumbing, electricity, and expanded living spaces (Diwan & Kumar, 2024). These changes reflect broader aspirations for comfort and modernity but contribute to the erosion of the vernacular identity. Moreover, contemporary construction often ignores the climatic and cultural logic embedded in Ladakhi architecture, resulting in buildings that are aesthetically discordant and functionally unsuited to the local context (Alexander, 2005).

6.4 Miyama Village

6.4.1 Aging Population and Depopulation

In Miyama Village, the aging population and depopulation have led to a significant number of kayabuki houses being abandoned (Fithriyah et al.,

2020). Many occupants of these traditional vernacular houses are one- or two-person households of elderly people, living alone (Jiao, 2014). The maintenance of the house often falls on the shoulders of the occupants. Only after the tourism development of Miyama that young people started their own small businesses in the tourism industry (Doshita, 2014).

6.4.2 Decline in Traditional Construction Knowledge

Like many other regions, Miyama Village has witnessed a decline in traditional building knowledge. The skilled craftsmanship required to build or restore *kayabuki* houses, particularly the thatched roofs, has dwindled due to the scarcity of experienced artisans (Takeuchi et al., 2012).

As there is a decline in straw culture and the professional craftspeople in roof thatching, it is becoming difficult to preserve this cultural practice without the support of initiatives. Facing increased typhoons and demographic shifts, the village has responded through heritage tourism, and craftsmanship revival (Doshita, 2010).

6.4.3 Adaptive Reuse and Financial Challenges

Despite these pressures, Miyama has leveraged heritage tourism and adaptive reuse to sustain some of its traditional homes. Through local and national initiatives, a number of *kayabuki* houses have been converted into guesthouses and cultural centers (Asia-Pacific Tourism Exchange Center (APTEC), 2023). These lodging facilities provide income that helps offset the high cost of maintaining the thatched roofs. For example, revenue from parking fees at the *Kayabuki no Sato* heritage site is partially allocated toward roof replacement (Asia-Pacific Tourism Exchange Center (APTEC), 2023).

Nonetheless, financial constraints remain a major barrier. The cost of roof restoration, the scarcity of skilled labor, limits the feasibility of preservation for many homeowners (Doshita, 2010). Although ownership rates are relatively high, many homeowners are reluctant to invest in repairs or seismic retrofitting due to the high costs (Jiao, 2014). Importantly, the designation of districts under the Important Preservation Districts for Groups of Historic Buildings (IPDGHB) introduces certain regulatory constraints on building modifications. However, these constraints have not significantly impacted residents' decisions regarding seismic retrofitting, rather, economic concerns and inheritance-related indecision remain the dominant deterrents (Jiao, 2014).

6.4.4 Cultural and Generational Shifts

Miyama's traditional homes reflect a generational shift in values, lifestyle, and housing priorities. Younger residents increasingly favor modern, convenient housing over the labor-intensive upkeep associated with traditional *kayabuki* dwellings. Materials such as metal and tile roofing, perceived as safer, more

durable, and less maintenance-intensive, are replacing the thatched roofs that once defined the architectural fabric of the village.

Beyond the houses themselves, these architectural changes reflect deeper shifts in land-use practices and ecological systems. Traditionally, thatched roofs were not only central to rural architecture but also to agricultural life. Grasslands surrounding Miyama were cultivated to produce thatching straw, compost, and multipurpose materials for crop and tea fields (Akimichi & Morimoto, 2012). The decline in the use of thatch has led to a corresponding decrease in grassland management practices, such as seasonal grass cutting and controlled burning (Akimichi & Morimoto, 2012). These practices once supported a broader agro-ecological system, including livestock feed in the form of straw and wild grasses.

As the agricultural economy shifted, particularly with the transition from labor-based animal husbandry to dairy production, the need for wild grass diminished (Akimichi & Morimoto, 2012). Grasslands were increasingly converted into sown pasture, and the ecological balance that once supported both agriculture and architecture began to erode. Furthermore, the replacement of traditional materials with plastic and tile has further severed the relationship between the built environment and its surrounding landscape.

6.4.5 Institutional Gaps and Preservation Regulations

In Miyama, the formal protection of traditional buildings is hindered by institutional gaps. Although the thatched-roof *kayabuki* houses are listed by local and national authorities, the legal protections often come with rigid restoration guidelines that may not accommodate the practical needs of homeowners. For example, restrictions on altering the roofs or modifying the interior layout to meet modern living standards can discourage property owners from seeking formal heritage listing.

In some cases, property owners prefer not to list their properties to avoid these bureaucratic challenges, leading them to undertake renovations that may not adhere to traditional methods. Without strong institutional support and clear incentives, many owners are left to navigate the complexities of preservation on their own, which often results in unregulated or incomplete restoration work.

Moreover, modern forest management policies in Japan since 1960s have restricted access to traditional timber sources, making the materials needed for *kayabuki* roofs harder to obtain (Piddington, 2015). This restriction on material sourcing is a problem also encountered in other regions, where the availability of local building materials is increasingly limited due to environmental and regulatory factors.

6.5 Dogon Village

6.5.1 Inheritance and Fragmentation of Property Ownership

In Dogon villages, land and buildings were traditionally passed through clan-based inheritance systems, upheld by local tenure norms (McLain, 1990).

However, modernization and urban migration have profoundly disrupted these practices. As younger generations relocate to urban centers and families migrate to places with more fertile lands (Dougnon, 2012), ancestral homes are often divided among multiple relatives scattered across distant locations, hindering collective decision-making and preservation efforts. Due to rural depopulation, many cliff-side villages are abandoned (Wikle, 2016).

The erosion of traditional knowledge about how to repair and maintain mud structures is a shared concern in many rural areas, where modern migration trends leave these homes vulnerable to decay (Wikle, 2016). The indigenous artisanship behind the construction of granaries, along with others, such as the ancient metal making and animal and plant carvings and symbols is at risk of loss. Due to the changes in land use and population growth, this loss of artisanship and building knowledge is compounded by the depletion of natural resources like clay and stone (World Monument Fund, 2005).

6.5.2 Cultural Preservation and International Awareness

Despite these challenges, the preservation of Dogon architecture has become a focus of growing awareness. Local and international organizations have recognized the importance of preserving these traditional structures and the knowledge associated with them. Through cultural preservation programs and the promotion of sustainable tourism, there has been a resurgence of interest in maintaining the Dogon villages (Walther et al., 2008). All the projects documenting and maintaining their built heritage show that tourism in the sites is a potential development factor and, at the same time, also offer very practical solutions for the rehabilitation of the built heritage (Walther et al., 2008).

Educational programs that teach traditional mud-brick construction techniques have been introduced, helping to revitalize the region's heritage (Alatalo, 2019). In both regions, the combination of international attention and community engagement has been crucial in safeguarding these cultural assets.

6.5.3 Legal Protection and Heritage Management

Some of the Dogon villages have been recognized by UNESCO for their cultural and architectural significance, bringing international attention and support to the region (UNESCO, n.d.). However, not all Dogon villages are officially listed or protected under Malian heritage law, which complicates efforts to protect these structures. In regions where heritage listings exist, the protection of these structures is not just a matter of legal classification; it also requires active community engagement and knowledge transmission.

The imposition of modern legal frameworks has sparked conflicts between statutory laws and customary tenure arrangements, further muddying property ownership (Land Tenure and Resource Access in West Africa: Issues and Opportunities for the Next Twenty Five Years, 1999).

6.5.4 Government and NGO Support

The role of the state in preserving Dogon architecture is limited, and government initiatives are sparse. The lack of formal institutional support makes it difficult to launch large-scale preservation efforts. This situation is similar to the challenges faced by other regions with limited state involvement in heritage preservation, where local knowledge and community-driven restoration efforts are often underfunded and lack official backing. Despite this, NGOs have played an important role in initiating preservation projects, but their efforts are often fragmented and insufficient to address the full scope of preservation needs. The absence of an overarching national strategy for heritage conservation continues to be a major obstacle in both the Dogon Villages and other rural regions facing similar challenges.

The project is rehabilitating the damaged architectural heritage, including 80 granaries and 80 traditional houses. It also is supporting the community to safeguard its traditions and develop income-generating activities for women (ALIPH (International Alliance for the Protection of Heritage), n.d.).

6.5.5 Generational Shifts and Changing Living Patterns

Traditional mud-brick homes, originally designed to house extended families and serve communal functions, no longer meet the needs of smaller families. As a result, the layout and structure of these homes have been altered, or in some cases, completely abandoned in favor of more modern living arrangements. Additionally, the use of modern building materials like concrete is on the rise, as these materials are perceived to offer greater durability and require less maintenance than traditional mud and straw.

This shift in materials and living patterns reflects a broader trend of modernization, where younger generations often prioritize convenience over the preservation of cultural traditions. Community participation in these projects is crucial and helps enhance the identity of the Dogon. These restoration projects have also been a platform for transferring the traditional building knowledge on to the next generation (Alatalo, 2019).

6.6 Conclusion: Addressing the Challenges of the Preservation of Vernacular Buildings

This chapter has examined the challenges of safeguarding vernacular heritage from the perspective of building owners and the local community, highlighting how changing socio-economic conditions and industrialization have affected the survival of these structures. The ongoing alterations to vernacular buildings reflect broader shifts in lifestyle, with many of the original building techniques and materials being abandoned or replaced by modern conveniences. From the 1950s onward, rural migration, industrialization, and economic changes have led to both the physical deterioration and the loss of traditional knowledge surrounding these buildings. Despite their significant

cultural and environmental value, these structures face a dire risk of collapse due to a lack of investment in their maintenance and the inability of local communities to continue traditional preservation practices.

In a broader context, the changing nature of building ownership and the generational shifts in how vernacular heritage is perceived directly contribute to these preservation challenges. As industrial and economic pressures replace manual artisanship, the knowledge required to maintain these buildings fades, leaving these structures increasingly vulnerable to the effects of climate change. Many of these buildings were originally constructed with an intimate understanding of the local climate, yet without proper maintenance, their climate-responsive design features, such as thermal insulation, natural ventilation, and materials adapted to local conditions, become ineffective. This loss of knowledge is compounded by the modern reliance on materials like concrete and brick, which are not suited for adapting to climate change, thereby reducing the resilience of these structures.

This chapter's findings underscore the urgent need to address the risks posed by climate change to vernacular heritage, especially in rural areas. Many communities now face an unmanageable cost of preservation, exacerbated by the impacts of industrialization and the erosion of traditional knowledge. Although governmental recognition through heritage listing can offer some institutional support, this is often insufficient when local communities lack the resources and capacity to maintain these buildings. Notably, the abandonment of these structures, driven by economic necessity and the allure of modernity, has accelerated the decline of vernacular heritage.

The implications of climate change are particularly concerning, as the vulnerability of these buildings increases in the face of rising temperatures, changing precipitation patterns, and more frequent extreme weather events. The absence of a supportive preservation infrastructure, coupled with a lack of awareness about climate resilience strategies, places these buildings at even greater risk. However, the resurgence of interest in sustainable living in the 2000s has provided an opportunity to revitalize rural areas, encouraging the return of younger generations and the potential to reclaim traditional practices. Yet, for these efforts to succeed, it is essential to integrate climate resilience into preservation strategies, addressing the evolving needs of these structures in response to a rapidly changing climate.

The challenges of preserving vernacular buildings are multifaceted, ranging from generational conflicts (n=11) and the loss of traditional knowledge (n=3) to the high financial costs of maintenance (n=8). These challenges are not isolated; they intersect in ways that exacerbate the decline of vernacular heritage. When local communities fail to value these buildings, they are less likely to invest in their upkeep. Likewise, the presence of multiple heirs can complicate ownership decisions (n=3), leading to abandonment (n=6). The listing of buildings for heritage status (n=5), combined with institutional support (n=2), can provide crucial financial assistance, but this often remains out of reach for many owners. Moreover, as traditional knowledge fades

and fewer artisans are available to undertake restoration work, the cost of maintaining these buildings rises, further discouraging preservation efforts.

As traditional materials and techniques, such as timberwork, fall out of use, the physical and cultural connection to these practices weakens. While projects like the EU-funded initiative to raise awareness about timber craftsmanship highlight the value of preserving these traditions, they are not enough to ensure the long-term survival of these skills and the structures they support. The collection of oral histories and local narratives has become even more important, as these stories offer crucial insights into the evolution of local customs and practices. However, the lack of awareness and the difficulty of passing down traditional knowledge threaten to leave these valuable resources forgotten.

One of the most significant barriers to the preservation of vernacular buildings is the lack of funding, which often leads to the abandonment of structures in favor of new, more affordable construction. The fact that local people can afford to build new houses but cannot invest in the preservation of older ones highlights the undervaluation of vernacular heritage. The revival of rural living styles in the 2000s has rekindled interest in these settlements, but in many cases, it has come too late to save buildings that have already fallen into ruin. As the physical presence of these structures continues to decay, the memories and traditions associated with them risk being lost entirely.

Local institutions, such as education centers, could play a key role in encouraging the preservation of vernacular housing by supporting local communities with incentives to embrace and preserve their traditional knowledge. Establishing an inventory of these practices can create job opportunities, enhance the training of preservation specialists, and foster the exchange of expertise. By supporting local artisans and encouraging the transmission of skills across generations, communities can take an active role in the preservation of their heritage.

In conclusion, the preservation of vernacular buildings faces numerous challenges, from the loss of traditional knowledge to the financial burdens of upkeep. Yet these structures offer valuable lessons in sustainability and climate resilience. By fostering local engagement, improving institutional support, and integrating climate-conscious strategies into preservation practices, we can protect these important cultural assets while enhancing their role in adapting to the impacts of climate change. The future of vernacular landscapes lies in recognizing the interconnection between culture and climate, ensuring that local knowledge is preserved and utilized to create more sustainable, climate-resilient communities.

6.7 Conclusion: Integrated Insights

The challenges of preserving vernacular architecture in the Dogon Villages, Leh-Ladakh, Miyama, and Fındıklı underscore a shared struggle against the

forces of modernization, urban migration, and environmental pressures. The key factors impeding preservation across all four regions include property fragmentation, the loss of traditional knowledge, legal ambiguities, and climatic conditions. However, there is also growing recognition of the cultural and economic importance of these buildings, with efforts from local communities, NGOs, and international organizations providing hope for revitalization.

To ensure the long-term survival of these traditional buildings, successful preservation efforts must combine local knowledge, modern preservation techniques, and community engagement. Governments must play a more active role in supporting these initiatives through policy frameworks, funding, and legal recognition. By integrating traditional practices with contemporary preservation strategies, these unique cultural assets can be safeguarded for future generations, offering not only a connection to the past but also a foundation for sustainable, culturally enriched communities.

Notes

1 They are durable and economical building elements, usually obtained by pouring a mixture of cement, sand, lime and water into special molds and pressing them.
2 Republic of Türkiye Ministry of Environment, Urbanization and Climate Change, "Rize İli Doğal Sit Alanları, Tabiat Varlıkları Ve Anıt Ağaçlar," https://rize.csb.gov.tr/rize-ili-dogal-sit-alanlari-tabiat-varliklari-ve-anit-agaclar-i-4430.

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7 Climate Change and Vernacular Landscapes

Narratives of Transformation and Resilience

7.1 Observed Climate Trends and Local Impacts in the Eastern Black Sea Region

Local perceptions and firsthand experiences reflect a tangible shift in climate conditions. While some residents attribute these changes to broader environmental trends, many associate them with intensified development in surrounding areas. The pursuit of economic gain has led villagers to expand into winter tourism, particularly in mountainous areas, as the summer season is too short to capitalize on sea tourism and investments in hotels along the Black Sea coast. In parallel, the southern Mediterranean, historically a prime summer destination, is grappling with droughts and wildfires (Moreno et al., 2023), prompting the government to redirect investment toward the Black Sea region. This shift places the coastline at risk of rapid overdevelopment, with infill projects for hotels and other commercial construction along the coastline potentially exacerbating flooding and sea level rise. Adjacent inland areas would be vulnerable, as well, facing stark transformations such as habitat fragmentation, vegetation loss, and other ecological devastation.

Table 7.1 Themes, codes, example quotations, and number of quotations from interviews with locals in Fındıklı, Rize. (indicating the number of times the codes were mentioned)

Themes	*Codes*	*Examples of Quotations*	*No of Quotations*
Current problems	Flooding	"When the rivers flooded, no one is around."	14
	Landslide	"Here is a landslide zone."	16
	Rainfall	"But what rain, I have not seen anything like. It again rained like this last year."	3
Future threats	Climate resilience	"The native tiles are water-resistant and durable."	17

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As one visible impact of a changing climate, a gradual climatic transition from continental to Mediterranean patterns is underway. While the eastern coast of the Black Sea and inner highlands are expected to experience even more rainfall in the future, there is a pronounced increase in temperature averages (Bağçaci et al., 2024). This warming trend is expected to support a diversification of crops due to increased solar radiation, as despite the region's fertile soil, limited sunlight has historically hindered crop productivity. Warmer temperatures may slightly alter transhumance patterns, which traditionally occur from mid-April through late October, due to earlier snowmelt in highland areas (Ocak Yetisgin et al., 2022).

Temperature increase is expected in the city of Rize, though to a lesser extent than continental cities like [Gümüşhane and Bayburt]. The most significant temperature increases are observed during the summer, impacting agriculture. In Çağlayan village, for example, homeowner S.Ş. reported that oranges now mature too quickly and drop prematurely due to the heat (S.Ş., Fındıklı coast, personal communication, January 14, 2019).

Precipitation trends show seasonal shifts, with October experiencing the most extreme rainfall and March the least. Snowfall, particularly in February and March, is expected to decline significantly due to global warming. Analysis of available data indicates that precipitation in Rize is projected to increase by 100 percent in spring. As a result, the frequency of floods in this region, particularly during the spring, may increase due to short-term heavy rainfall combined with the melting of snow, which is intensified by rising temperatures (Nacar et al., 2024). These trends are accelerating the decay of timber and stone materials used in vernacular construction. Rainfall is especially intense on the hillsides of Rize, frequently resulting in floods and infrastructure failures, including collapsed bridges.

Annual relative humidity data from 1980 to 2018 show fluctuations, with a low of 69 percent in 1982 and a high of 82 percent in 2018. The highest annual relative humidity is recorded in October (88.7 percent) and peak precipitation levels are reported in August (86.6 percent). Annual data on relative humidity for 2018 mark February, May, and December as the most humid months. These long-term trends, evident in linear regression models, affirm climate projections indicating rising humidity and precipitation levels. Such environmental changes are accelerating the deterioration of vernacular construction materials, especially wood and stone, and increasing the frequency of damaging events such as floods and landslides that result in the collapse of infrastructure.

Over 38 years, winds have prevailed from the southerly, westerly, and northerly directions, with northwesterly winds being the strongest in winter (Karadeniz Kültür Envanteri, n.d.). Easterly winds, like the *bora*, occur primarily in summer and autumn. Föhn winds—a dry, warm phenomenon—appear every few years, primarily inland (Yetmen, 2014). Coastal and highland areas experience no true dry season. Vernacular structures typically orient stone façades northwest to resist wind

damage. Yet, with reduced wind strength (Figure 7.2), traditional ventilation and cooling systems are becoming less effective. The increased humidity and temperature now contribute to structural degradation, especially in wooden elements, challenging the original climate-responsive design of these homes.

The concurrent rise in temperature, humidity, and precipitation—coupled with declining wind power—represents a significant departure from both historical climate norms and global trends. While the reduced wind velocity may partly reflect changes in meteorological station placement, the implications remain critical. The loss of natural air circulation reduces summer cooling potential, while the warmer, wetter conditions exacerbate the decay of wooden construction materials and threaten the structural integrity of traditional buildings. These changes call into question the long-term viability of vernacular architectural strategies that were once well-suited to their environmental context.

7.1.1 Flooding

Flooding in the region predominantly occurs between March and May, as snowmelt from the hills and mountains triggers water surges. According to F.H., historic building owners often leave their homes and migrate to western cities when flooding is imminent (Çağlayan, personal communication, January 12, 2019). Despite their extensive knowledge of local construction, residents remain anxious about their safety during these events. This concern is particularly acute for those living in newly developed urban areas near rivers, as reported by six interviewees, who recounted personal experiences of flood-related damage.

Although the government has yet to take significant action to address the ongoing flood threats, the damage to lives, infrastructure, and settlements remains a pressing issue. The threat of flooding is particularly severe in the city center, but the extent of losses in the hinterland is not well documented. In one interview, Ş.S. recalled a tragic event from 20 years ago when severe flooding destroyed a house in a nearby village, claiming the lives of a mother and her two children (personal communication, January 14, 2019). Similarly, a young boy swept away during the 2018 flooding has never been found.

In recounting the severity of past floods, Ş.Ö. noted:

> There was a flooding 50 years or 45 years ago but the most serious one was in 2016... The damage in the Beydere village was more severe. A child was drowned. few storage houses that went as such, some houses in Aslandere and Beydere villages were damaged by floods... The upper villages [referring to the villages at higher altitudes and distant from the district centre] were affected more severely.
>
> (Çağlayan, personal communication, July 6, 2019)

According to the statements of Y.G. and Ş.S., the floods caused the collapse of the biggest storage house in the village, one of the few in the region that had a double door (Y.G., personal communication, July 5, 2019; Ş.S., personal communication, January 14, 2019). M.A. recalled:

> There was a beautiful old storage house on the side. It [referring to the flooding] damaged the storage house too...They came to us while they [referring to the owner of the storage house] escaped from the disaster, they sheltered here, I was here.
>
> (M.A., Çağlayan, personal communication, January 12, 2019)

While flooding is expected, the risk zones have expanded. In 2016, for example, the Çağlayan River flooded, cutting off the road to the Çağlayan village (B.U., Çağlayan, personal communication, January 10, 2019). During the first field survey, locals highlighted Beydere as a flood- and landslide-prone area, but observations during a follow-up survey indicated that Çağlayan, once considered at low risk, now faces an increased threat due to the river's flooding. River flooding in the area often triggers landslides, especially in the surrounding hilly terrain. Although Çağlayan village, being in a lowland area, historically had a low risk of landslides, a concrete flood defense was installed along the river in 2019 by the Hydraulic Works to address the increasing risk.

This reveals that the relatively low-risk area now carries a higher risk of hazards, as agreed by H.Ş.:

> The land facing the rear façade eroded twice. We were affected by it. It eroded two years ago, and the rear façade degraded twice. North facade. There are a lot of landslides happening here and this is why this area of Çağlayan village is announced as a landslide zone... A very big storage house has gone down below.
>
> (H.Ş., Çağlayan, personal communication, June 30, 2019)

Even large structures are not immune to damage depending on the scale of the event. Consequently, villages like Çağlayan and Aslandere, home to many cultural and natural heritage sites, are increasingly situated within flood zones. However, disaster databases from the DSI and AFAD fail to extend to the hinterland, leaving these areas underrepresented in hazard mapping. While interviewee testimonies provided valuable information about disaster-prone vernacular buildings, precise data on their locations was often lacking. To address this gap, these areas were mapped using interview data (as detailed in Chapter 5).

Based on this analysis, it became clear that Çağlayan, in addition to Beydere, is now a flood-prone area. Flooding in these regions is often compounded by landslides, particularly in the hilly areas surrounding the villages.

7.1.2 Landslides

Beydere Village, while located at a higher elevation, is concurrently named along with Çağlayan Village in the interviews of local people as the area most affected by floods and landslides. It is referred to as a disaster region due to the frequency of these events. There are very few remnants of the original historic buildings in this village, while the remaining ones are extensively modified (Figure 7.1). Seven interviewees emphasized the damage to the vernacular buildings caused by landslides. In addition to Beydere Village, which was previously mentioned as a risky area, Karaali Village was also reported by C.K. as a landslide zone where historic buildings were damaged (C.K. Hara, personal communication, July 3, 2019).

Landslides have impacted public spaces as well. According to B.U., the 2018 landslide in Çağlayan damaged the local school, detaching the land it sat on (B.U. Çağlayan, personal communication, January 10, 2019). While some landslides are linked to deforestation for tea cultivation, others, like on Ş.Ö.'s property, occurred independently of such changes:

> The land there was eroded. It shook the storage house but did not demolish it. But this time, it destroyed the trees... There was a landslide at the back of my house, even though it is not dedicated to a tea field...
> (Ş.Ö., Çağlayan, personal communication, July 6, 2019)

Figure 7.1 The hazard area of Beydere village, where an entire cliff collapsed, with mostly new settlements. Photograph by the author on July 6, 2019.

Land use change remains a key factor. Forests cleared for tea cultivation weakened slope stability, as the shallow roots of tea plants offer minimal soil support. Still, landslides are more prevalent in sloped terrain than in lowland areas like Çağlayan, where they occur less frequently despite visible land use changes.

Several buildings were partially damaged, particularly at their rear façades. Ş.Ö.'s house stands out, rebuilt using materials from a 250-year-old structure destroyed during the 1916 Russian invasion, then again after a fire, which was set by thieves. In its most recent reconstruction, which combined salvaged materials with aspects of modern Turkish architecture, the building was oriented toward a hillside, now vulnerable to landslides. Reflecting on this, Ş.Ö. stated:

> Could not these [referring to the design decisions of where to settle, build a house, and which materials and techniques to use] be thought of when these structures were built? The storage house is 250-200 years old. Why did they build it here? If I knew, I would dismantle it and rebuild it in another place… I sometimes think whether I should change the position of the main door this way?
>
> (Ş.Ö. Çağlayan, personal communication, July 6, 2019)

This case illustrates how the loss of traditional building knowledge over successive generations has contributed to maladaptive reconstruction practices, with vulnerabilities dating as far back as the mid-20th century.

Residents have also observed broader human impacts on the landscape that may be contributing to climate change. Deforestation, particularly for tea cultivation (see Chapter 5), has emerged as a key concern. Tree-covered slopes provide natural protection against landslides and rockfalls. Although rockfalls were rarely mentioned in interviews, T.H. identified them as a hazard specific to his property. His house, situated on a 70-degree slope, was built with a reinforced stone rear façade to mitigate such risks (T.H. Gürsu, personal communication, July 2, 2019; see Figure 7.2).

Historically, village houses did not require retaining walls at the rear, as the walking paths behind them were narrow, often no wider than 1.5 meters. The rear façades were constructed to lean directly against the slope. However, increased accessibility through vehicle roads and land clearance for parking and tea farming has contributed to a rise in landslide incidents. In some instances, landslides occurred even in areas unaffected by deforestation. M.A. recounted a 2019 landslide and attributed its cause to abnormal water flow:

> It is not because it rained a lot here. Here, there was a natural water discharge that drained the water there. The excessive water maybe came from the sea as a hose… So the rainwater damages something along the way. But in this case, there was no place to accumulate water.
>
> (M.A. Çağlayan, personal communication, January 12, 2019)

Figure 7.2 T.H. house is vulnerable to rock falls, which is why the rear façade was built with stone with no opening. Photograph by the author on January 11, 2019.

In response to such hazards, the Disaster and Emergency Management Presidency (AFAD) assists local communities with post-disaster recovery (H.Ş. Çağlayan, personal communication, June 30, 2019). The agency assesses and documents structural damages but provides compensation only if a historic building is damaged by a landslide. If a retaining wall was constructed preemptively by the homeowner, it is not eligible for reimbursement. The incentive is only for the preservation of the historic building if it is damaged by the landslide.

While many retaining walls are recent additions, there are earlier examples, such as the wall behind T.H.'s house, originally built to guard against rockfalls (see Figure 7.2). In contrast, the retaining wall behind Ş.Ö.'s house was a later intervention. These structures have now become standard components of the local landscape. However, there have been no efforts to reforest cleared areas as a strategy for disaster risk reduction. Residents largely rely on these walls, believing that sufficient height can effectively protect their properties from future landslide damage.

Interestingly, Karaali Village, situated in the Arılı Valley, was identified by interviewees as another landslide-prone area. However, it did not appear in the spatial analysis (see Chapter 4). This discrepancy highlights the value of community knowledge, suggesting that local observations can provide essential insights for policymakers in disaster preparedness and risk management.

7.1.3 Changing Rainfall Patterns

Three interviewees highlighted the increasing severity of rainfall and its tangible impacts on both the natural and built environments. These intensified rainfalls, accompanied by fluctuating temperatures and humidity, have contributed to significant crop failures. As part of this evolving environmental landscape, Y.G. observed that pear trees no longer bear fruit in the area (Y.G. Çağlayan, personal communication, July 5, 2019), while H.Ş. noted that cherry trees, once abundant, now yield only a few fruits (H.Ş. Çağlayan, personal communication, June 30, 2019).

While some residents attributed these changes to external factors such as the increased use of chemical fertilizers and the construction of dams, many acknowledged the undeniable effects of climate change. Reflecting on the noticeable reduction in agricultural productivity, Ş.S. described a marked deterioration in both crop health and environmental conditions:

> Now even the crops are not growing. The environment is decaying. We do organic farming with pigeon manure, but the weather pattern has changed. For example, orange drops timelessly, but it should not fall from its tree so early. It has just matured. We produced the orange in 2017 but it is not ripening this year...But now the fruits do not mature enough and fall from the trees earlier.
>
> (Ş.S. Çağlayan, personal communication, January 14, 2019)

Local residents, many of whom were born and raised in the region, possess an intimate understanding of its traditional climate rhythms. However, recent weather anomalies have signaled a profound shift. Ş.Ö. recalled a dramatic storm event that underscored this new climatic reality:

> We took the car and waited inside the car in the school garden. Rain falls, and then the rain level goes up to 25 cm as if a movie is directed. It is lightning up and blinding white snow, trees are shaking, the wind is blowing, and raining. It was raining in the past too, but I have not seen anything like that. Now that we experienced it, we are afraid.
>
> (Ş.Ö. Çağlayan, personal communication, July 6, 2019)

Traditionally, vernacular buildings in the region were adapted to heavy rainfall, with extended roof eaves, often up to 150 cm, to shield facades from precipitation, as seen in Çağlayan Village. However, with the intensification of rainfall, even these design features are sometimes inadequate. In Hara Village, for instance, C.K.'s house had roof eaves extending less than 100 cm, resulting in significant water exposure and accelerated deterioration of the upper façade (C.K. Hara, personal communication, July 3, 2019).

These extreme rainfall events have had particularly damaging effects on historic buildings, especially those that have been abandoned. C.K. emphasized that even minimal water infiltration can lead to serious structural degradation: "Both this part of the façade and wooden windows are decayed … *Çakatura* type of construction technique could not survive" (C.K. Hara, personal communication, July 3, 2019).

The Çakatura construction technique has proven unsustainable in the face of current climatic conditions. As a result, local builders have largely abandoned it. Although some buildings were plastered during renovations in the 1950s in an attempt to modernize and protect them, many of these facades have since been damaged by rainfall. Local residents, recognizing the vulnerability of plaster to water, have begun removing it altogether in contemporary renovations.

While historical construction methods, such as using timber for structure and furnishings, may now be viewed as less climate-resilient, they also offered a regenerative approach, relying on natural materials that could be replenished over time. In contrast, modern construction often employs non-renewable materials that are difficult to reuse and contribute to environmental degradation through landfill disposal.

The testimonies collected indicate that changing rainfall patterns are as disruptive and damaging as flooding and landslides. They not only affect agricultural productivity but also contribute to the accelerated decay of the region's historic built heritage. This dual impact highlights the urgency of incorporating climate resilience into both conservation practices and future adaptation strategies in rural settlements.

7.2 Comparative Cases

7.2.1 Leh-Ladakh

Leh-Ladakh, situated in the high-altitude deserts of northern India, is experiencing profound changes due to the impacts of climate change, including shifting temperature and precipitation patterns, cloudbursts, flash floods, and water shortages (A. Kumar et al., 2018; R. Kumar et al., 2018). These changes have significantly impacted the local communities in vulnerable highland areas as much of them rely on natural resources heavily for subsistence.

Erratic precipitation, flash floods, and reduced snowfall are undermining the traditional building methods used in stone and mud homes (Nasir & Arif Kamal, 2021) by threatening the stability of traditional stone and mud-built structures. The old town of Leh was added to the World Monument Funds list of 100 most endangered sites due to increased rainfall, climate change, change in settlement patterns, and commercialization (World Monument Fund, n.d.). These changes not only challenge the physical integrity of these structures but also disrupt the cultural continuity of local communities as well as transhumance activities, including nomadic life and livelihoods. Their

traditional grazing grounds, essential for the survival of their herds, are now inaccessible due to military deployments on both sides of the border (Life on the Planet Ladakh, 2024).

Rapid and poorly planned urbanization, driven largely by a tourism boom, has further exacerbated the region's vulnerability (International Association for Ladakh Studies (IALS), n.d.). According to the Climate and Development Knowledge Network, while some parts of Leh are at heightened risk of sudden flash floods, others endure the slower, more subtle impacts of "invisible disasters,"gradual environmental changes that often escape public attention and media coverage (Namgyal et al., 2025).

7.2.2 Miyama

In Miyama, the need for energy-efficient homes is increasing as temperatures rise, putting traditional timber-framed homes at risk from humidity and storm damage.

Due to the considerable age of its buildings and frequent exposure to heavy snowfall, inundation, and sediment disasters, structural degradation is more severe in Miyama than in comparable regions in Japan (Jiao, 2014). In particular, damage to columns and foundations is common (Jiao, 2014). Nonetheless, repair activity remains relatively high, every damaged house in Miyama has undergone some form of restoration, with comprehensive repairs being more prevalent than in other districts. This proactive maintenance is made possible in part because 90 percent of homes maintain long-term relationships with local carpenters, facilitating ongoing upkeep and timely interventions (Jiao, 2014).

Despite this, issues such as high moisture content in columns, largely due to the age of buildings and poor underfloor ventilation, remain persistent problems. Effective long-term preservation thus requires routine attention to ventilation, anti-termite treatment, and structural monitoring (Jiao, 2014).

7.2.3 Dogon

Dogon villages in Mali are increasingly vulnerable to the compounded effects of climate change, socio-political pressures, and cultural shifts. Once adapted to the arid conditions of the Sahel, their traditional mud-brick architecture is now being compromised by new climate patterns, torrential rains erode structures that were historically resilient in dry environments. Prolonged droughts and expanding desertification further strain both the built and natural environment.

These environmental stresses are accompanied by demographic changes, religious influences, tourism, conflict, and the abandonment of ancestral villages, all contributing to the erosion of intangible cultural heritage and identity (Wikle, 2016). Water scarcity, migration, and conflict are disrupting

vernacular landscapes and ways of life. One critical impact is the loss of biodiversity, including endemic plants like *Acridocarpus monodii*, essential in local healing traditions and spiritual practices (UNESCO, n.d.).

Additionally, resource scarcity has intensified farmer-herder conflicts, which are likely to escalate in the future (Benjaminsen & Ba, 2021). These tensions, along with climate-related crop failures, pest outbreaks, and declining soil productivity, threaten the cultivation of subsistence staples such as millet and sorghum, cornerstones of Dogon food security and culture (Beek, 1991).

7.3 Navigating Future Climate Challenges

Personal narratives collected from local residents highlight the growing urgency of climate-related risks to vernacular landscapes, risks that are increasingly acknowledged in national climate policy frameworks. As introduced in Chapter 1, the Turkish Ministry of Environment, Urbanization, and Climate Change (formerly known as the Ministry of Environment and Urban Planning), under Minister Murat Kurum, unveiled the Regional Climate Action Plan for the Black Sea Region on July 12, 2019.[1] This plan emphasizes a collaborative approach, including the active participation of NGOs and universities in mitigating the impacts of climate change.

Among the 15 action items outlined for the city of Rize, several focus specifically on the built environment. Particularly relevant to the preservation of cultural heritage is Article 13, which promotes the use of local materials in construction as a strategy for climate resilience. A significant implication of this policy is the legal exemption from taxes or construction-related fees for houses built using local materials and traditional techniques, an incentive that could support the continuity of vernacular practices.[2]

Traditional architectural elements, such as the eaves of historic buildings, which range from 80 cm to 180 cm, were originally designed to protect facades from heavy precipitation. Roofing systems in these structures also reflect climate adaptation. Ottoman tiles, traditionally used in the region, offer water resistance and durability compared to many modern substitutes. As noted by Y.Y., these native tiles are wider than conventional types, providing more efficient coverage and rain protection (Y.Y. Çağlayan, personal communication, January 11, 2019).

Despite their proven effectiveness, modern materials such as corrugated aluminum roofing sheets (e.g., Onduline) and European tiles are prohibited by KUDEB (Conservation Council for Cultural and Natural Heritage) in the restoration of listed historic buildings. However, the high cost of restoring vernacular roofs with traditional materials remains a challenge for many local households.

In terms of disaster response, the Disaster and Emergency Management Authority (AFAD) remains the primary national stakeholder. However, its interventions focus on post-disaster recovery, leaving pre-disaster

preparedness and risk mitigation to local communities. While governmental institutions, such as the General Directorate of State Hydraulic Works, attribute flooding largely to man-made activities, local testimonies point to broader climate change dynamics, offering a more nuanced and site-specific understanding of evolving environmental threats.

This gap between institutional priorities and local knowledge is especially critical when maladaptation occurs. For instance, in 2019, a concrete riverbank modification was implemented to accommodate new housing developments along the river. This intervention not only altered natural water flow and displaced flood-prone zones, but also increased the vulnerability of nearby vernacular houses, which were historically located with greater environmental awareness. The river narrowing ultimately led to the destruction of both newly built and existing structures on either side of the river, especially in areas where the modification was most extensive.

These examples illustrate that threats to vernacular heritage are not isolated or historic but intimately tied to contemporary development and climate policy decisions. The destruction of recently built homes underscores the fact that maladaptation and short-sighted planning do not discriminate between old and new constructions. As climate-induced disasters increase in both scale and frequency, there is a pressing need to recognize that preserving vernacular architecture is not only a cultural responsibility but also a strategy for sustainable and climate-resilient development.

7.3.1 Comparative Cases

The comparative cases of Leh-Ladakh (India), the Dogon region (Mali), and Miyama (Japan) reveal diverse adaptive capacities and institutional engagements in the face of climate change. Despite geographical and cultural differences, a common thread emerges: rural households often exhibit limited autonomous adaptive capacity, especially where formal governmental support is lacking.

In both Leh-Ladakh and the Dogon Plateau, adaptation efforts are constrained by limited national government involvement, making communities heavily reliant on international institutions for financial and technical support (Haard, 1991). Nevertheless, strong social networks within these communities play a vital role in enhancing resilience, particularly in flood preparedness and recovery phases (Namgyal et al., 2025). These networks act as informal safety nets, often filling the void left by absent or under-resourced public institutions.

In contrast, the case of Miyama, Japan, illustrates how proactive governmental support can significantly bolster heritage preservation and climate resilience. The integration of heritage into formal policy frameworks, along with investment in infrastructure and sustainable tourism, underscores the importance of top-down intervention in preserving cultural landscapes under environmental stress.

Across all cases, one consistent challenge is the misalignment between modern spatial and urban planning strategies and traditional settlement patterns. Where planning frameworks fail to integrate vernacular knowledge or landscape logic, they may unintentionally increase vulnerability rather than mitigate it. Historical disaster events have further highlighted these mismanagement issues, offering critical lessons on the need for coherent, culturally aware, and locally responsive planning approaches.

7.4 Conclusion: Harnessing Local Knowledge to Enhance Climate Resilience of Vernacular Heritage Sites

The narratives shared by local residents, combined with government reports and meteorological data, underscore the value of integrating local knowledge with spatial analysis to identify at-risk vernacular heritage sites. These narratives not only pinpoint additional areas of concern but also reveal significant gaps in disaster risk management for vernacular settlements, especially when considering their broader environmental contexts. The approach of supplementing spatial mapping with local testimonies is not only effective for this case study but can also be adapted to other regions facing similar climate-induced challenges, such as flooding and landslides. While the impacts of climate change can transcend regional, national, and global borders, the disasters themselves remain localized, affecting the inhabitants and structures of regions that are particularly vulnerable to such effects (Jigyasu, 2019). Although localized climate change impacts may vary across geographic locations, common patterns and concerns persist, particularly regarding the effects on local heritage and community responses. Understanding these localized impacts is essential for developing effective strategies to protect cultural assets and to foster resilience.

It is evident that climate change adaptation efforts must integrate both spatial planning and local knowledge. The success of cultural heritage preservation depends on a robust network of stakeholders, including artisans, local administrators, and community members, all of whom contribute valuable insights and expertise. By examining the traditional practices of underrepresented communities, we can uncover specific climate knowledge and adaptation strategies that should inform climate change policies and planning processes. While regional climate action plans, such as the one endorsed by the Turkish government, advocate for the use of local materials in construction to enhance climate resilience, these policies often fall short in practice. Legal restrictions, such as those safeguarding forests and rivers, hinder the widespread application of such materials. Moreover, the disconnect between top-level decision-makers and the realities faced by local communities leads to mismatches in spatial planning and local practices. Inadequate information and slow and vague regulatory processes exacerbate the challenges of disaster preparedness.

The documentation of vernacular heritage must not only capture the original state of cultural assets but also account for subsequent interventions that reflect either maladaptation or successful climate resilience strategies. Heritage is a dynamic, evolving entity, and heritage professionals must acknowledge and embrace these constant changes. A shift from reactive to proactive approaches in heritage conservation is necessary, particularly in response to climate changes. This shift should involve not only the adaptation of vernacular buildings to changing environmental conditions but also the incorporation of sustainable practices, such as rainwater management for reuse, reforestation, and design interventions compatible with the original building for climate comfort.

The recent catastrophes illustrate the limited financial support provided by the government during recovery efforts. Despite the significant damage to cultural heritage, national, regional, and local authorities, such as the AFAD,—rarely include cultural and natural heritage losses in their disaster databases. These databases do not necessarily focus on the cultural and natural aspects of heritage. Therefore, integrating the database of the Trabzon Cultural and Natural Heritage Preservation Board into disaster planning is essential for understanding the vulnerabilities of these heritage sites.

The recurring patterns of post-disaster recovery, along with past failures to anticipate and manage risks, underscore the need for a more inclusive and anticipatory approach to disaster management. Current political initiatives aimed at combating climate change continue to build on past shortcomings in disaster preparedness and recovery. Until the perspectives, experiences, and insights of local communities are incorporated into these efforts, top-down strategies to address climate change and disaster risk management will remain insufficient. The history of disaster management in the region highlights the short-sightedness of decision-making at national, regional, and local levels.

7.4.1 Integrated Strategies for Climate Adaptation and Cultural Resilience

Community-driven solutions must be integrated into broader regional water management strategies, supported by sustained funding and interdisciplinary research. Collaborations between local communities, researchers, and government agencies enable the co-development of adaptive practices that remain effective amidst evolving environmental and socio-economic conditions (Namgyal et al., 2025). These grassroots approaches, rooted in traditional knowledge but enhanced by contemporary innovations, offer scalable models for water management across arid and semi-arid regions globally.

A shift toward renewable energy sources, particularly solar power for heating. This transition is vital not only for environmental sustainability but also for enhancing the adaptive capacity of remote and underserved communities.

Moreover, promoting climate education and public awareness campaigns is essential to empower individuals and communities. By increasing

understanding of climate change impacts and available adaptation options, such education fosters informed decision-making and collective action.

Preserving cultural heritage plays a critical role in resilience building. Linking heritage assets, such as sacred landscapes and historic urban cores, with ecological green infrastructure can prepare historic cities and sites to better withstand climate-related stresses. These landscapes often embody *culture-based climate resilience*, where their spiritual and ecological values also serve as models for forest conservation and sustainable land management (Sabour, 2023).

Digital preservation efforts, such as those undertaken by the University of Leiden (n.d.), are equally crucial (University of Leiden, n.d.). Digitization not only safeguards intangible and tangible heritage but also facilitates broader access for research, education, and community engagement in climate planning.

Notes

1 Türkiye Cumhuriyeti Çevre ve Şehircilik Bakanlığı, "Karadeniz Bolgesi İklim Degisikligi Eylem Plani."
2 Türkiye Cumhuriyeti Çevre ve Şehircilik Bakanlığı, "Karadeniz Bolgesi İklim Degisikligi Eylem Plani."

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8 General Conclusions Toward Integrated Climate and Disaster Risk Management for Vernacular Heritage Sites

8.1 Key Conclusions

This research has examined the intricate relationship between spatial planning, local practices, and the preservation of vernacular heritage sites under the growing pressures of climate change. By adopting an interdisciplinary approach—drawing from history, heritage studies, urban planning, and environmental analysis—and utilizing both qualitative and quantitative methods, the study reveals critical mismatches and synergies across scales and stakeholders.

One of the central findings is the paradoxical role of spatial planning. While historical analysis (Chapter 4) shows that traditional vernacular construction practices inherently incorporated climate resilience, contemporary planning decisions have largely failed to address or mitigate disaster risks (Chapter 5). Moreover, local communities today face mounting challenges not only in preserving these sites (Chapter 6) but also in adapting them to increasing environmental hazards (Chapter 7).

Comparative analysis across global case studies underscores this dynamic. In Leh-Ladakh, India, for example, traditional mud-brick houses historically addressed thermal comfort and seismic risks. However, urban sprawl and tourism-led development are replacing vernacular architecture with concrete, leading to loss of both climate efficiency and cultural identity. Similarly, in Miyama, Japan, the preservation of thatched *kayabuki* houses relies heavily on communal knowledge and seasonal maintenance rituals, practices now threatened by depopulation and aging demographics. Meanwhile, Dogon villages in Mali, known for their terraced earthen architecture adapted to arid climates and wind erosion, now face compounded vulnerabilities from desertification, conflict, and weakening traditional institutions.

Spatial analyses identified only three high-risk sites (Chapter 5). However, interviews revealed a broader range of affected sites, including risk-prone locations like Karaali village, which were not documented in AFAD's disaster risk database. This parallels challenges in Dogon, where official records often exclude heritage damage resulting from micro-climatic changes or slow-onset environmental degradation. Such gaps highlight the importance of integrating local

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narratives with spatial data to construct more accurate, inclusive risk assessments. This discrepancy underscores the importance of integrating local narratives into spatial mapping tools, thereby enriching and correcting official data on disaster risk. Such a methodological fusion provides a more comprehensive understanding of heritage vulnerabilities in dynamic, climate-sensitive regions.

Current preservation policies tend to apply a one-size-fits-all approach. In Miyama, for example, stringent cultural property regulations can make modern energy retrofits difficult, even when such upgrades would support heritage continuity. Likewise, in Leh, standard housing schemes overlook passive solar heating traditions inherent in *Ladakhi* homes. A bottom-up framework, enriched with spatial data, would foster more nuanced and locally appropriate interventions. Spatial analysis helps scale down the issue in a particular area where the analysis of the lived experiences of local communities, policy, and information systems presents fine-grain materials.

Longstanding issues, such as depopulation, neglect, and the erosion of traditional building knowledge, continue to impair the adaptive capacity of rural communities. Although many residents attempt to maintain their homes with reference to vernacular traditions, they lack the resources for meaningful adaptation, particularly regarding energy efficiency (see Chapter 6). Renovation strategies must, therefore, account for both ecological challenges and vernacular integrity. For instance, the use of solar panels in vernacular homes could be a viable solution if aligned with traditional materials and design values. Yet conflicting priorities, limited funding, and fragmented responsibilities among stakeholders impede progress.

As such, the analysis of the interviews also highlighted that a number of vernacular heritage buildings were already lost or damaged, including storage houses. One significant implication of the analysis of the case study area interviews and observations is that the most common damages to the vernacular heritage sites are the deterioration of the rear façade and material loss. One of the three sites identified as at risk in the spatial analysis was in fact matching with one of the interview statements about the Şevket Ataç house. Indeed, this site appears to be in a landslide-prone area, according to the ArcGIS mapping analysis and the statements regarding the rear façade loss. However, the other two sites found to be at risk through the ArcGIS mapping did not appear in the statements of the local people. This may be because the interviewees had no information on the possible damage to these two buildings.

Field observations and interviews further documented the gradual lost and damaged vernacular buildings, including storage houses. The most common forms of damage include the deterioration of rear façades and loss of original materials. Notably, one of the identified at-risk sites (the Şevket Ataç House) aligns with both spatial and interview data, demonstrating how integrating different sources of knowledge can validate risk assessments. However, the other two at-risk sites identified through GIS mapping were not recognized by local participants in the interviews, possibly reflecting gaps in local awareness or visibility.

A notable theme throughout the study is that both spatial and local level decisions and practices overlapped in terms of the underlying cause of these destructions, such as deforestation to make space for growing tea. It also reveals the contradiction between large-scale planning initiatives, such as hydroelectric projects, and local conservation goals. In Leh, rapid infrastructure development has destabilized hillsides and intensified flash flooding. Similarly, in Dogon, externally imposed cement constructions clash with the traditional earthen aesthetic and can increase internal heat stress. These cases collectively stress the need for governance models that integrate macro-scale development with micro-scale heritage sensitivity. While some degradation stems from unsustainable local practices, broader infrastructural interventions have had a more damaging impact on vernacular landscapes. This points to a critical need for more integrated governance that balances national development goals with local cultural and environmental resilience.

8.1.1 Rethinking Scale and Temporality

The research emphasizes the importance of "downscaling" climate issues to reflect local specificity, community relations, and traditional knowledge systems. In all three comparative sites, this principle is manifest. In Miyama, architectural orientation is closely tied to seasonal sun paths, and communal thatching days represent not only maintenance practices but also cultural rituals. In Leh, homes were traditionally aligned to benefit from solar gain during cold winters. In Dogon, spatial orientation relates to sacred cosmologies and wind management, choices passed down through oral traditions.

Recognizing site-specific practices, such as communal interactions, seasonal rituals, privacy, hospitality, and food cultures (Chapter 4), enables more resilient and culturally sensitive preservation strategies than those based solely on aggregated data. Downscaling appreciates the authenticity and value of "bottom-up" work and different knowledge systems around it, which cannot be fully captured by quantitative datasets alone. This calls for the need to shift our approach away from major interventions and toward local, cheaper, and more robust solutions.

Temporality also plays a critical role. Diurnal rhythms (such as the placement of doorways for the benefit of early morning chores), seasonal practices, and intergenerational knowledge all influence the ways communities adapt and interpret their environments. This is clearly seen in Miyama, where thatched roof cycles follow seasonal calendars, and Dogon, where rainwater harvesting and façade repair are synchronized with annual weather patterns. This genealogical knowledge shows how local people are able to make their decisions based on the experiences and direct narratives of their ancestors. Oral histories and lived experiences serve as vital archives of adaptation and resilience, expressing the processual nature of heritage rooted in collective memory. Understanding these long-term patterns can inform management strategies that are both sensitive and sustainable.

8.1.2 *Toward Participatory Risk Governance*

Despite data from disaster databases, such as those from AFAD or the Istanbul Metropolitan Municipality, there is a lack of granularity regarding whether affected buildings are heritage sites, how land-use changes contribute to risk, or whether there are broader spatial patterns of vulnerability driven by infrastructural developments. For instance, two buildings were damaged on 2nd October in 2020 and similarly, on 27th July in 2021. In both cases, the Arılı River in Meyvalı Village flooded. While official records document flood events in Meyvalı Village, they fail to indicate whether heritage sites were affected or whether upstream interventions contributed to the flooding. This mirrors issues in Leh, where disaster relief rarely includes heritage restoration, and in Dogon, where cultural sites are often absent from national climate adaptation frameworks. This highlights a critical institutional gap: no single agency is currently responsible for protecting and evacuating cultural heritage in the event of a disaster. Coordination and knowledge-sharing among institutions, communities, and NGOs is urgently needed. In Miyama, strong local governance helps bridge this gap, with community associations taking charge of risk preparedness and repair cycles. Such participatory models could inform similar structures elsewhere.

Moreover, fragmented data from various institutions, including the Ministry of Culture and Tourism, KUDEB (Trabzon), DOKAP, and DSI, fails to provide a comprehensive understanding of at-risk heritage sites. The inconsistencies between datasets, such as those of AFAD and DSI, further complicate disaster planning. A shared, updated, and integrated database among the Ministry of Environment, Urbanism and Climate Change, the Ministry of Culture and Tourism, and AFAD could significantly enhance risk mapping and decision-making. Knowledge transfer is needed not only between the institutions but also among local communities and people to increase awareness of and collaboration around the disaster risk management of vernacular heritage sites.

A core finding of this study is the disconnect between centralized planning and community realities. Official decisions rarely incorporate local experiences, and community insights are seldom leveraged in risk assessments. Learning from traditional climate practices (Chapter 3) and integrating local knowledge, such as site suitability, wind direction, and material vulnerability, can help inform spatial planning in more meaningful ways. Without inclusive processes, there remains a disconnect between development plans and the realities of those living amidst vernacular landscapes.

Both top-down planning and bottom-up adaptation have contributed to the degradation of vernacular landscapes. Yet this dual contribution also offers a pathway forward: integrated strategies must harmonize development goals with heritage preservation, ensuring that heritage stakeholders have a voice in climate resilience planning. Moreover, community aspirations for climate adaptation often remain unmet due to institutional inaction

or insufficient funding. In Dogon, Leh, and Miyama, community-led efforts have demonstrated the value of inclusion, despite resource constraints.

Institutions often frame disaster risks in terms of human activities, while local communities highlight climatic changes and mismanagement. Despite inevitable losses, some heritage will endure—as ruins, fragments, or restored structures—prompting a re-evaluation of our perceptions of legacy, memory, and material culture. Vernacular heritage, in this light, becomes not only a reflection of the past but also a resource for building climate-adaptive futures.

The study ultimately calls for renewed attention to vernacular heritage and its embedded traditional knowledge systems. Local, climate-adaptive building practices, rooted in sustainable materials and techniques, hold valuable lessons for future architectural and planning innovations. Reviving and learning from this knowledge can inspire new paradigms of climate resilience rooted in cultural continuity.

Moving beyond mere disaster risk and impact assessments, it is crucial to distill traditional knowledge from local practices, and embrace nature-based solutions at both spatial and local scales. This approach recognizes the value of vernacular landscapes not only as cultural heritage but also as living systems shaped by the continuous interaction between nature and culture. Viewing these landscapes through the lens of the nature–culture relationship allows for more grounded and context-sensitive strategies in rebuilding climate-adaptive cities. In doing so, spatial planning and climate adaptation practices must shift toward more dynamic and responsive frameworks. As Robert Z. Melnick emphasizes, it is essential to "embrace flexibility" in spatial planning, climate adaptation, and heritage management across multiple levels (Melnick, 2009).

An integrated view of disaster risk reduction (DRR) and climate change adaptation (CCA) in the context of cultural heritage calls for a shift away from single-hazard, building-level approaches toward a more holistic, multi-hazard perspective (Aktürk & Hauser, 2025). This perspective emphasizes the importance of shared, integrative practices of DRR and CCA within heritage sites, recognizing the complex vulnerabilities and values embedded in these environments (Aktürk & Hauser, 2025). A better inclusion of cultural heritage, in all its tangible and intangible forms, within spatial planning strategies and policy frameworks is essential to ensure both the resilience and continuity of these sites (Aktürk & Hauser, 2025). While emerging conceptualizations of climate as living heritage are beginning to open new possibilities for more flexible and responsive frameworks (Adamson & Rapson, 2024), the multiplying effects of climate change, ranging from increased conflict and forced migration to direct physical damage, are becoming ever more urgent and visible (Simpson et al., 2024). Addressing these challenges requires adaptive and inclusive planning approaches that recognize heritage as both a source of vulnerability and a reservoir of resilience.

8.2 Recommendations for Future Research

This study contributes to the ever-evolving discourse on climate change and cultural heritage by offering empirical and conceptual insights into risk, resilience, and adaptation. While its focus is geographically specific, the methodological framework, integrating spatial analysis, oral history, and policy review, can be applied more broadly.

Future research should explore the latent vulnerabilities of undocumented heritage, expand the scale of digital database creation, and investigate the impacts of incremental environmental change. Greater emphasis on oral narratives, participatory mapping, and community-based monitoring will also support more inclusive and adaptive heritage governance.

As the climate crisis intensifies, vernacular heritage must be re-evaluated not only as a site of memory but also as a repository of sustainable knowledge. The integration of this heritage into future planning processes will be critical, not simply to conserve the past, but to build more resilient futures.

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