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Title:

Developing a Framework for Improving Climate Resilience in Cultural Landscapes

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Abstract

Cultural landscapes are places where human and natural forces come together. Landscapes are places where knowledge is stored, and variables change slowly, yet they are also places where change is constant. As a spatial expression of a socio-ecological system, a cultural landscape provides a space for social learning and cross-disciplinary action. For decades, rural protectionist ideologies have dominated landscape governance. However, this viewpoint has evolved to include environmental sensitivity in land management, exemplary sustainable development methods, and broad stakeholder participation in setting goals. If this is to progress towards the promotion of spatial resilience, scientists and policymakers must have a better understanding of the optimal rates and intensities of change, as well as the functions and potential tipping points of landscapes. To do this, urban planners must take action in space and place. They need to give space for natural systems to reconnect, renew themselves, and promote spatial properties that give people a sense of security, enrichment, and knowledge. Deliberative processes and the principled pursuit of sustainability must be used to regulate interventions in the direction of landscape change, which can be controversial and challenging at times. This research aims to understand how urban governance and policy may provide room for enhancing the resilience of cultural landscapes to climate change risks by selecting the cultural landscapes of Cinque Terre (Italy) and the Region of Waterloo (Canada).

The case studies were selected using a number of criteria. First, there was the presumption that the fact that Italy and Canada are both industrialized Western economies with robust democratic governance systems makes it possible for an easier comparison of research findings. This assumption was based on the fact that both countries have governance systems that are very similar. In addition, unlike Italy and Canada, the United States lacks a national land-use planning

framework of its own. Second, different regions of the world are impacted by the effects of climate change in a variety of unique ways: It is anticipated that the mean temperature will rise in the majority of sites. In addition, some areas will have an increase in precipitation, whilst others will face an increase in the frequency of droughts. Therefore, rather than specifying particular climate change impacts as selection criteria, my objective was to get a deeper understanding of methods that facilitate participatory planning for the purpose of mitigating risk in cultural landscapes in response to a wide range of climate change effects. As a result, adding case studies from the United States would have added complexity to any comparison and was thus avoided. Finally, a criterion for case study selection was the requirement for long-term research interest in the issue. The cultural landscapes of Cinque Terre (Italy) and the Region of Waterloo (Canada) were chosen as study case studies based on these characteristics. The current study is also one of the first to evaluate the effects of climate change on a cultural landscape under the jurisdiction of UNESCO (the Cinque Terre) with a regionally administered landscape (Region of Waterloo).

According to the findings, even though there are now frameworks for evaluating climate change risks, future climate resilience planning in cultural landscapes should incorporate local populations into planning practice more effectively. In addition, many social, institutional, and environmental concerns must be adequately addressed in order to develop measures to mitigate climate change risks and increase resilience. Furthermore, from preparation to recovery, the local community must be included in all phases of resilience strategies. Accurate identification and communication, ability and skills, trust, and involvement in decision-making are required to ensure that cultural landscape participation programs are comprehensive, sustainable, and effective.

Keywords: cultural landscape; socio-ecological system; climate change; resilient; landscape planning

Preface

This dissertation is part of the broader "Resilient Landscapes" project (RE-LAND), which was led by Professor Massimo Sargolini at the University of Camerino from 2019–2021 and funded by the Italian Ministry of Foreign Affairs and Cooperation. Its ultimate purpose was to contribute to the development of a culture and practice of disaster risk reduction and "building back better" through improving catastrophe preparedness and disaster prevention. It also focuses on plans, strategies, and proactive steps that may help mitigate risk and make a landscape more resilient. By developing collaborations with scholars from various institutions in North America who have been involved in practical research on the same subjects for a long time, RE-LAND seeks to provide insight into this topic. As part of the RE-LAND project, my study utilizes a landscape vision and a bottom-up planning approach to protect cultural heritage resources from climate change. Under Prof. Sargolini's supervision, I had a valuable opportunity to collaborate with North American universities on the topic of climate change and cultural landscape conservation. In light of this, I was appointed as a visiting scholar from September 2020 to December 2021 at Cornell University's Department of Natural Resources and the Environment in New York. In the meantime, I also remotely collaborated with the School of Planning at the University of Waterloo in Canada.

In this dissertation, cultural landscapes are assumed as the unique parts of each territory that show how a local community interacts with the natural environment over time. Through this international collaboration, I emphasized the significance of combining cultural heritage and nature conservation policies to protect cultural landscapes in the face of climate change. In order to do this, I realized that while collaborating across disciplines, we need to be clear about our terminologies. For example, in Europe, conservation has mostly been addressed in terms of cultural heritage; while, in the United States, it has acquired the role of protecting natural resources.

Conservation in the United States dates back to the nineteenth century, with the establishment of the first National Park. Conservation is the act of using land and/or its natural resources

consciously and efficiently. This might take the shape of reserving tracts of land from hunting or urban expansion, or it can consume fewer resources like metal, water, or coal. Typically, this conservation process happens as a result of or following the passage of municipal or national law. While conservation and preservation have similar definitions and broad categories, preservation in the natural and environmental scope refers to the action of keeping areas as they are and attempting to dissuade the use of its resources; conservation may employ similar methods but does not call for the reduction of resource use and rather a responsible way of going about it. In Europe, cultural heritage conservation and restoration focuses on protecting and caring for cultural property (tangible cultural heritage), such as artworks, architecture, archaeology, monuments, museum collections, and intangible heritage. Preventive conservation, examination, documentation, research, treatment, and education are all examples of conservation efforts. This area is closely related to conservation science, museums, and registrars.

In this dissertation, cultural landscapes are defined as a system of synergistic links between diverse parts of the physical environment, the built environment, and the anthropic environment. In order to be effective in protecting cultural and natural resources, climate adaptation initiatives, in my opinion, must have these three elements. I selected Cinque Terre and the Region of Waterloo as two distinct examples of cultural landscapes with comparable governance structures, and I discuss the critical actions taken to manage the risks of climate change in both locations using a bottom-up approach in planning practice. The case studies were chosen based on several criteria. First, there was an assumption that the similarity of the governance systems in Italy and Canada allows for a robust comparison of research findings, as both countries are industrialized Western economies with strong democratic governance systems. Second, climate change affects various parts of the globe in different ways: Most locations are predicted to experience an increase in mean temperature; in addition, some regions will receive more precipitation, while others will see more frequent droughts. Therefore, rather than defining specific climate change effects as selection criteria, I aimed to learn in-depth about approaches that encourage participatory planning for reducing risk in cultural landscapes across various climate change effects. Finally, the need for long-term research involvement in the cultural landscape of the geographic subject area was a criterion for case study selection. Based on these criteria, the cultural landscapes in Cinque Terre (Italy) and the Region of Waterloo (Canada) were selected as the research case studies.

Acknowledgment

Completing my doctoral dissertation reflected the conclusion of a fantastic and special academic experience at the University of Camerino. During this period, not only did I achieve a personal goal, but I also made some wonderful memories. There is no better moment for me to express my thanks and admiration to Professor Massimo Sargolini, who made this opportunity feasible and transformed it into a formative experience for me professionally and personally.

For the opportunity to participate in a mobility program in the United States, I am grateful to Professor Federico Bellini and Professor Michele Talia, coordinators of the School of Architecture and Design at the University of Camerino. Also, I would like to thank Dr. Cristina Soave at the International Office of the University of Camerino, who was always there to help me out with administrative and organizational issues.

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I would like to thank Professor Michael Drescher and Dr. Chris DeGeer from the School of Planning at the University of Waterloo in Canada for sharing their knowledge of Waterloo's cultural landscapes with me.

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List of Abbreviations

GDP	Gross Domestic Product
HUL	Historic Urban Landscapes
ICCROM	International Centre for the Study of the Preservation and Restoration of Cultural Property
ICOMOS	International Council on Monuments and Sites
IUCN	International Union for Conservation of Nature
OUV	Outstanding Universal Value
SDGs	The United Nations Sustainable Development Goals
The Convention	1972 UNESCO Convention Concerning the Protection of the World Cultural and Natural Heritage
UN	United Nations
UNESCO	United Nations Educational, Scientific and Cultural Organization
WHC	World Heritage Committee
WHS	World Heritage Site

Chapter One
Introduction

1.1. A Short Statement of Background Information

The scientific evidence is overwhelming that the climate is changing, and human activity is the primary cause of the recent acceleration of climate change. Regardless of how successful humans are at limiting the root causes of our planet's warming, society will face significant consequences, including more frequent and severe weather, ocean warming and acidification, prolonged drought, extreme temperatures, and other negative effects of climate change. Climate resilience is the capacity to prepare for, recover from, and adapt to these impacts. Resilience is becoming a common word in the climate change discourse. Because climate change is both a global and a local issue, the severe extreme weather events demonstrate that resilience is essential to any comprehensive climate action program. The local level is where we should focus our efforts to build resilience. It will require comprehensive cooperation and coordination to address this problem. However, addressing climate risks will protect people, landscapes, and cultural property and support the goals of Agenda 2030 for sustainable development (Center for Climate and Energy Solutions, 2019).

1.2. State of the Art

Compared to other fields, the field of cultural heritage has not done as much research on how to adapt to climate change as other fields have. Since the IPCC's first report came out in 1990, research, practices, and policies have been going on in many areas (agriculture, health, transportation) to adapt to climate change. However, there has not been much study on adapting cultural heritage; most studies have only looked at potential dangers. Little has been done to plan

for adaptation, put it into action, and manage it. Landscapes all over the world are facing more and more natural and climate-related risks. Many of these risks are related to the environment, such as extreme weather, lack of water, pressure on other natural resources, and loss of biodiversity. Environmental and climate-related risks are inextricably linked to other risks and have frequently been ranked among the top five global risks in terms of both impact and probability since 2011 (WEF 2017). Many landscapes, particularly those on the coast, are vulnerable to environmental and climate-related risks and hazards (Boyd and Juhola 2015). As climate change continues, it is anticipated that both the frequency and severity of these risks will increase. The effects of climate change could have significant repercussions for the efficient management of cultural landscapes, which are a component of cultural heritage resources. These landscapes include natural and built environments. The concept of resilience is being used more and more as a way to organize scientific and political conversations about landscapes. Documents from the United Nations (UN) about cities (and landscapes) state how significant it is. A diverse range of stakeholders committed to developing policies, programs, plans, and actions to make cities more resilient in the recently passed New Urban Agenda (Habitat_III 2016). The United Nations Sustainable Development Goals (SDGs) emphasize, among other things, how important it is to strengthen urban resilience. The Sendai Framework for Disaster Risk Reduction 2015–2030 is referenced in Sustainable Development Goal 11 (SDG 11), which states that cities (and landscapes as part of the cities) should adopt plans to build their resilience in accordance with the framework. Sustainable Development Goal 9 is focused on developing resilient infrastructure to support sustainable development (UNSDG 2015). Many policy documents, such as the Hyogo Framework for Action 2005–2015 and the Sendai Framework for Disaster Risk Reduction 2015–2030, stress the importance of incorporating resilience thinking into urban planning. Even though resilience has been a hot topic for decades in fields like physics, ecology, and psychology, it is a relatively new concept in urban planning and design, having only been introduced about twenty years ago (Sharifi and Yamagata 2016). Since the turn of the century, the field of urban planning and design has paid increasing attention to resilience. As stated previously, landscapes around the world are more vulnerable than ever to a wide variety of environmental and climate-related risks. Even though there have been efforts to incorporate resilient thinking into urban planning [for example, see Wilkinson 2012a, b], there is still no common understanding of the implications of resilience for the planning and management of cultural landscapes. This dissertation aims to shed more light on

this topic by analyzing the literature on landscape resilience and addressing how resilience can be used to offer new conceptual grounds for planning theory and practice. It explains paradigm shifts that should take place during the integration of resilience into cultural landscape planning theory and practice.

1.3. The significance of research

There is strong evidence to suggest that humans may be directly responsible for the emergence of this phenomenon, and there is a growing concern about climate change issues nowadays (Masson-Delmotte et al., 2018). Climate change would destabilize environmental and social conditions, and these disruptions could threaten the sustainability of socioecological systems (Programme, 2011). As socioecological systems, climate change, directly and indirectly, impacts the tangible and intangible characteristics of cultural heritage sites.

Cultural heritage sites are vulnerable to changes in weather patterns (Sabbioni et al., 2010), which are not limited to direct impacts on the built structure (Leissner et al., 2015) but also have very indirect consequences such as fragmentation of populations, loss of intangible features (Henderson & Seekamp, 2018), a decline in visitor numbers, and disruption of socio-economic activities (Markham et al., 2016a).

Climate change is likely to affect cultural diversity and social interactions by forcing communities to change their work habits and ways of life, compete for resources (Black et al., 2011), or move somewhere else (Black et al., 2011). For example, desertification, flooding, and sea-level rise are all caused by climate change (Collete, 2007; Kim, 2011). The effects of climate change on the loss of social community (Adger et al., 2013), traditional knowledge, cultural identity (Colette, 2007), or natural and socio-economic systems (IPCC, 2014b) have been well studied, but few studies have looked at how climate change affects cultural heritage sites (Fatorić & Seekamp, 2017a). The impacts of climate change on heritage sites are frequently investigated in conservation studies, with the assumption being made that cultural heritage is a singular and unchanging concept.

From the perspective of urban and regional planning, the majority of conservation studies view cultural heritage as a static object (Bandarin & van Oers, 2012), and have typically defined it in accordance with the principles of the World Heritage Convention, which was adopted by the United Nations Educational, Scientific, and Cultural Organization (UNESCO) in 1972. (World Heritage Centre, 1972). Climate change is a new challenge for UNESCO, and the organizational

solutions for the preservation of cultural heritage sites are in their infancy (Colette et al., 2007). Heritage and climate change are dynamic fields of study (Kalman, 2014), and the associated socioeconomic changes will have a greater impact on preserving cultural resources than climate change alone (D. C. Harvey & Perry, 2015).

1.4. The research objectives and questions

Cultural landscapes are social-ecological systems formed by traditional human land uses during the co-evolution of a community and nature. Changing climatic conditions have made various natural hazards more destructive, putting cultural landscape sustainability at risk. While dealing with natural disasters, planning for risk reduction and resilience is critical. However, no conceptual framework has been developed to comprehend the intricate links between resilience and planning to deal with natural hazards in cultural landscapes. As a result, the purpose of this research is to begin the process of developing a conceptual framework for integrating resilience planning into the management plan of cultural landscapes.

1.4.1. Main research goal

It is possible to view changes in climate as a driving force behind the development of various conservation policies. In addition, while climate change is transforming social, economic, and political dynamics with a degree of uncertainty, revising the concept of cultural heritage can be seen as a critical factor in the effectiveness of policies designed to increase climate resilience.

As a result, the purpose of this research is to spark a discussion about the meaning of cultural heritage as the first step in the process of formulating climate-resilience policies for heritage sites, all the while keeping in mind that climate change is altering the social, economic, and political dynamics in a variety of different locations. So, the primary focus of the research is on:

- *What does it mean to talk about cultural landscapes and heritage when climate change is a factor? Are there any implications of climate change for conservation practices that call for a shift away from the current paradigm?*
- *What does it mean to talk about cultural landscapes and heritage when climate change is a factor? Are there any implications of climate change for conservation practices that call for a shift away from the current paradigm?*

1.4.2. Specific research goal

Natural disasters have become increasingly common in recent years. In 2018, for example, 289 natural disasters affected 61.7 million people and killed 10,733 people. In this regard, climate-related risks such as storms, hurricanes, and flooding killed 90% of disaster victims (Center for Research on the Epidemiology of Disasters (CRED)., 2018). The number of people at risk is expected to grow as natural disasters become more common, as will the economic costs associated with disaster severity and recurrence. A variety of risks can contribute to the emergence of a disaster. When a disaster occurs, it is the result of several factors, including the nature of the hazard, the level to which people have been exposed, the susceptibility of the landscape, and the ability to mitigate or manage potential harm. If long-term social and economic development is to be sustained, "disaster risk reduction" and "resilience" are critical components of such action.

Resilience is a theoretical and policy concept that is constantly being rethought and redefined. To be effective, public managers and bureaucrats must embrace resilience and translate it into practical forms that make sense to them in terms of both academic and operational reasoning (Normandin et al., 2019). In order to address this gap, this study aims to develop a conceptual model for risk reduction and resilience planning in the context of cultural landscapes. So, the specific focus of the research is on:

- *How can cultural landscape development and management be linked to resilience in order to mitigate the effects of climate change?*
- *What are the main scientific obstacles that must be overcome, and what research gaps must be filled?*

1.5. Research hypothesis

The primary hypothesis underpinning this investigation is that the effectiveness of climate-resilience policies will not be immediately apparent (Caldarice et al., 2019). Therefore, how the concept of cultural heritage is defined in light of climate change will be of utmost significance for the protection of cultural heritage and, as a result, for the long-term sustainability of the cultural landscape.

1.6. The scope of research

This research is limited to examining how resilience can support socioecological transformation in cultural landscapes in light of climate change and how it can be utilized as a management tool for climate adaptation and sustainable futures.

1.7. Terminology

The research utilizes the definition provided in Annex II of the IPCC Glossary in its methodology (Agard et al., 2014).

- **Climate change**

  It refers to 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. Climate change may be due to natural internal processes or external forcings such as modulations of the solar cycles, volcanic eruptions, and persistent anthropogenic changes in the composition of the atmosphere or in land use.

- **Climate-resilient pathways**

  The iterative processes for managing change within complex systems in order to reduce disruptions and enhance opportunities associated with climate change.

- **Community-based adaptation**

  Community-based adaptation focuses attention on empowering and promoting the adaptive capacity of communities. It is an approach that takes context, culture, knowledge, agency, and preferences of communities as strengths.

- **Coping**

  The use of available skills, resources, and opportunities to address, manage, and overcome adverse conditions, with the aim of achieving the basic functioning of people, institutions, organizations, and systems in short to medium term.

- **Cultural impacts**

  Impacts on material and ecological aspects of culture and the lived experience of culture, including dimensions such as identity, community cohesion and belonging, sense of place, worldview, values, perceptions, and tradition. Cultural impacts are closely related to ecological impacts, especially for iconic and representational dimensions of species and landscapes.

- **Disaster**

  Severe alterations in the normal functioning of a community or a society due to hazardous physical events interacting with vulnerable social conditions, leading to widespread adverse human, material, economic, or

environmental effects that require an immediate emergency response to satisfy critical human needs and that may require external support for recovery.

- **Disaster risk**

  The likelihood of within a specific time period of disaster. See Disaster.

- **Disaster Risk Management (DRM)**

  Processes for designing, implementing, and evaluating strategies, policies, and measures to improve the understanding of disaster risk, foster disaster risk reduction, and transfer, and promote continuous improvement in disaster preparedness, response, and recovery practices, with the explicit purpose of increasing human security, well-being, quality of life, and sustainable development.

- **Disaster Risk Reduction (DRR)**

  Denotes both a policy goal or objective, and the strategic and instrumental measures employed for anticipating future disaster risk; reducing existing exposure, hazard, or vulnerability; and improving resilience.

- **Ecosystem**

  A functional unit consisting of living organisms, their non-living environment, and the interactions within and between them. The components included in a given ecosystem and its spatial boundaries depend on the purpose for which the ecosystem is defined: in some cases, they are relatively sharp, while in others, they are diffuse. Ecosystem boundaries can change over time.

- **Risk**

  The potential for consequences where something of value is at stake and where the outcome is uncertain, recognizing the diversity of values. Risk is often represented as the probability of the occurrence of hazardous events or trends multiplied by the impacts of these events or trends occurs. Risk results from the interaction of vulnerability, exposure, and hazard. In this report, the term risk is used primarily to refer to the risks of climate change impacts.

- **Risk assessment**

  The qualitative and/or quantitative scientific estimation of risks.

- **Risk management**

  Plans, actions, or policies to reduce the likelihood and/or consequences of risks or to respond to consequences.

- **Sustainability**

  A dynamic process that guarantees the persistence of natural and human systems in an equitable manner.

Chapter Two
Research Methodology

2.1. Material and Methods

This dissertation intends to create or develop insights into the socioecological resilience of cultural landscapes by drawing on empirical data from Europe and also examining research from the Americas. The thesis creates a conceptually focused and consistent sketch of resilience and cultural landscapes by using shared characteristics of the case studies. Specifically, it explores what contribution the resilience toolkit may provide to understanding landscape change. It questions how the concept of the cultural landscape may contribute to the resilience strategy.

The Sendai Framework for Disaster Risk Reduction 2015–2030, adopted by the UN General Assembly following the UN Third World Conference on Disaster Risk Reduction in 2015, has set a new course for disaster risk reduction. The Sendai Framework calls for a "substantial reduction of disaster risk and losses in lives, livelihoods, and health and in the economic, physical, social, cultural, and environmental assets of people, businesses, communities, and countries." The challenges for incorporating cultural landscape management within the Sendai Framework are listed below.

The first crucial question is the consequence or purpose of resilience: for what purpose is resilience? In ecological literature, the desired result of resilience is frequently uncritically characterized as sustainability. Defining what is valuable in a historical site is always based on normative judgments. Some features are seen as "natural" or "good," while others are written off as lacking adaptability or resilience. Reaching a different landscape form may not be considered a sign of resilience if the tangible and intangible characteristics differ from acceptable ones. The

second challenge is defining a cultural landscape boundary. In a specific socio-ecological system, resilience analysis must ask, "Resilience of what to what?" It implies that experts will unavoidably focus on certain factors while disregarding others. In the context of cultural heritage, a limited approach quickly results in fragmented practices.

The third issue is to translate resilience from ecology to heritage. Issues like what is the "desired outcome" and "resilience for whom" are at the core of this discussion. The ecological literature on resilience is almost powerless and apolitical, mainly because ecologists frequently believe that "there are no incentives or punishments in nature, just consequences." This statement may be true; however, in a historic landscape, there are always incentives and consequences: in the process of building resilience, some individuals benefit while others suffer. So, in a sociocultural setting, we cannot judge resilience without looking at questions of justice and fairness in both the way decisions are made and the way responsibilities and benefits are shared.

According to Fatori'c and Seekamp, barriers to cultural resource resilience can be categorized along four dimensions, including (i) institutional, (ii) technical, (iii) financial, and (iv) social barriers, and increasing research on climate adaptation strategies and impacts on cultural heritage characteristics, as well as collaboration among multi-level actors, are among the primary requirements for overcoming these barriers (Fatorić & Seekamp, 2017b). Other academics argue that policies targeting disaster prevention and preparedness need to be changed to meet the transformation of heritage in an era of climate change (Porrini & De Masi, 2021). In addition, institutional issues, such as a lack of cross-sectoral integration, are still a problem. Therefore, teamwork and integration are frequently mentioned as fundamental to a successful response and resilience (Aktürk & Dastgerdi, 2021). Enhancing resilience can be encouraged via multi-sector partnerships, which involve collaboration between various business, governmental and organizational actors (Porrini & De Masi, 2021).

The methodology is largely based on the European Landscape Convention of the Council of Europe. This methodology is concerned with the assessment of the landscape "as it perceives" by the local community. I collect data for this study via a variety of approaches, including both quantitative and qualitative approaches. Data collecting using quantitative approaches can more easily be used to the incidents of the frequency of extreme weather events. On the other hand,

when the data collected need to be more fruitful, such as in the instance of adaption techniques, observation, interviews, and self-reflection are the research methods that are most suited.

This research will focus on constructing an effective adaptive climate model to ensure the continued viability of cultural landscapes in the face of shifting climatic conditions, notably by creating decision-supporting tools. During the course of this investigation, both Italy and the United States will participate in the process of joint learning. In the first stage of the process, an adaptive climate model is developed to protect the resources that make up cultural heritage at the regional scale. The application of this model will be tested in the second phase when Cinque Terre (in Italy) and the region of Waterloo (in Canada) are chosen as the test cases. In conclusion, the model is improved by considering the comments provided by all partners and consultants.

The findings of the studies that Professor Michael Drescher and Dr. Christopher DeGeer carried out on the region of Waterloo in Canada are incorporated into this dissertation as a secondary source. Both researchers are affiliated with the University of Waterloo.

2.2. Research procedure

In the first stage, I present theoretical ideas on human-shaped ecosystems as socioecological systems and/or cultural landscapes. The introduction is followed by a discussion of a theoretically informed approach to the study of cultural landscapes. In the second phase, I explore the function of landscape interventions (planning, management, and preservation) and how these may impact the thresholds of landscape change. Then, I discuss the conceptual history of the cultural landscape and resilience methods, illuminating the normative assumptions underlying both notions and highlighting potential connections between them. In the fourth phase, I investigate the human–nature link in the literature pertaining to landscapes and resilience. In phase five, possible conflicts between the spatial dimension of the landscape and the ecological techniques are examined. In the sixth stage, I offer findings on the opportunities and advantages of combining resilience and landscape study, and I suggest prospects for science and practice.

2.3. Data analysis

The three principal phases of data analysis are as follows:

The initial step would be to collect information from documents and international agreements related to the preservation of historical fabrics through library studies from the archives of international organizations such as UNESCO, ICOMOS, ICCROM, IUCN, and the European

Union. This is done so that the information collected can be used as the primary source for the research.

The second step would be to find and figure out what the case study's cultural and historical values are. This action is made up of two parts. First, it looks at the physical and social-ecological aspects of case studies by looking at their history. Second, it looks at the state of conservation in the chosen case studies. The comparison of these two parts gives case studies intervention a place to start.

In the third phase, I would create a comparison analysis of the data gathered in the previous steps to arrive at the necessary results. In other words, according to the principles defined for the historical quarters, common principles and strategies in international documents on the preservation of the historical fabric (results of the first step) are corrected and developed along with the development principles. This is done in conjunction with the principles for the development of the historical quarters. The logical reasoning approach will be utilized throughout this research project stage.

2.4. Limitations of the Research

A key consideration in determining an adaptation limit is the nature, likelihood, and magnitude of losses at this limit. Losses may be material or immaterial, physical, cultural, or monetary. In addition, these are often substantial and perhaps disastrous for the concerned actor. After adaption, these would be considered acceptable (residual) damage at lower levels. In many circumstances, adapting to maintain an acceptable level of risk may involve some residual risk. In such situations, losses may also be deemed reasonable. The cultural landscape as a socioecological system must be comprehended.

2.5. Diagrammatic representation of the research method

The following diagram (Figure 2.1) depicts how the suggested study may be structured in accordance with the methods described above:

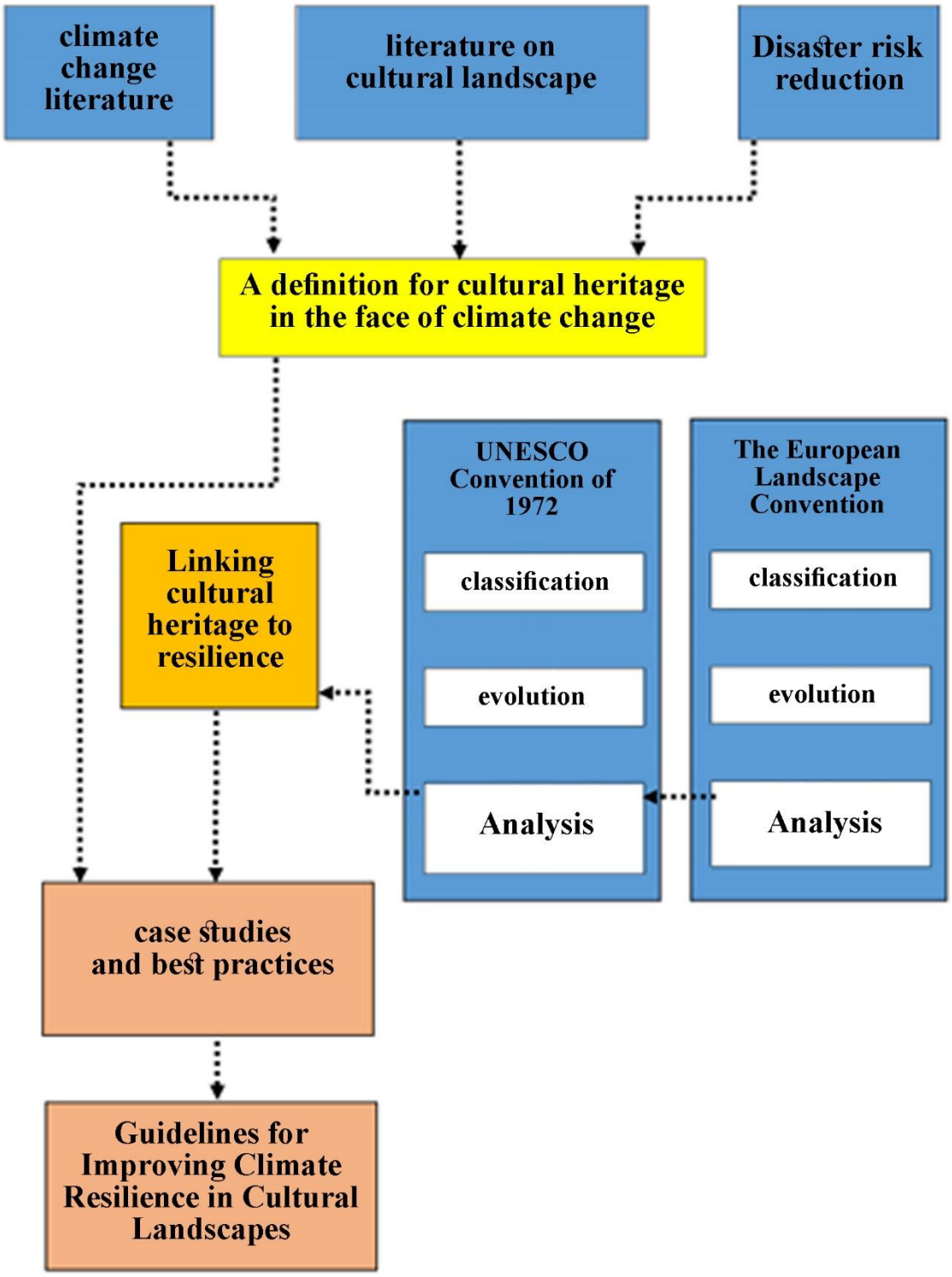

Figure 2.1 Diagrammatic representation of the research method

Chapter Three
Literature Review

3.1. Direct impacts of climate change on cultural heritage monuments

According to Colette et al. (Colette et al., 2007), the direct impact of climate change on cultural sites primarily damages the construction of ancient buildings in a variety of ways (Table 4.1).

- Archaeological evidence stays in the ground because the hydrological, chemical, and biological processes of the soil have reached a balance. Some sensitive types of materials may have an average level of durability if these parameters are changed in both short and long cycles.
- Historic structures are more joined with the earth than contemporary ones. They are more permeable and absorb water from the soil into their structure, only to lose it through evaporation. Their wall and floor surfaces are the exchange locations for these reactions. Increases in soil moisture may result in increased salt mobilization and subsequent deterioration of decorative surfaces upon drying.
- Timber and other organic construction materials may be susceptible to biological infestation, such as the spread of pests to previously unaffected latitudes and elevations.

Climate indicator	Climate change risk	Impacts on cultural heritage
Moisture	Intense rainfall Flooding Groundwater changes Changes in soil chemistry Changes in humidity cycles	Damage due to faulty or inadequate water disposal systems Physical changes to porous building materials and finishes due to rising damp
Temperature	Extreme events, like heat waves, snow loading Changes in freeze-thaw	Deterioration of facades due to thermal stress Damage inside brick, stone, ceramics that have got wet and frozen within material before drying
Sea-level rises	Coastal flooding Sea-water incursion	Coastal erosion Population migration Disruption of communities
Wind	Wind-driven rain Wind-transported salt Wind-driven sand	Penetrative moisture into porous cultural heritage materials Static and dynamic loading of historical or archaeological structures
Desertification	Drought Heatwaves Fall in the water table	Erosion Salt weathering Impact on health of the population Abandonment and collapse Loss of cultural memory
Biological effects	The spread of existing and new species of insects Changes to lichen colonies on buildings	The collapse of structural timber and timber finishes Changes in the appearance of landscapes
Pollution	Changes in the deposition of pollutants	Stone recession by the dissolution of carbonates Blackening of materials

Table 3.1. Climate change impacts on cultural heritage (Colette et al., 2007)

3.2. A comprehensive approach to climate change impacts on cultural heritage sites

The assessment of how vulnerable heritage sites are to the impacts of climate change needs to consider the complex interactions that occur within and between ecological, cultural, and socioeconomic components. In this way, the impact of climate change can be both direct and indirect on natural and cultural heritage sites.

Documenting cumulative processes to supplement event-based data is a more challenging topic that will require scientific research to support it. It is necessary to convey information regarding the following specific areas of need:

- Prediction of subsidence and uplift due to extreme weather;

- Understanding the local effects of wind-borne dust and contaminants that cause erosion and weathering;
- Understanding the water-resistance of construction materials and methods;
- Heritage-specific modeling and monitoring of climate change;
- Analyzing the effects of fresh migration and infestations of pests, such as termites;
- Analyzing the environmental performance of historic structures in extreme weather conditions;
- Analyzing the interface between delicate and extremely durable materials.

3.3. Assessment of climate change risks

A vulnerability assessment comprises an assessment of the extent and severity of prospective climate change consequences. The study of risk reduction necessitates an awareness of the threats and a depiction of the system's behavior when exposed to the hazards (Esposito et al., 2017). Vulnerability is a developing climate science and policy topic. Over the last decade, attempts to assess vulnerability to climate change have prompted a process of theory development and assessment practice, represented in the Intergovernmental Panel reports on climate change (Füssel & Klein, 2006).

Figure 3.1 depicts a framework in which climatic dynamics are seen as a key driver of change in social and biogeophysical contexts. Climate change alters the frequency and magnitude of natural risks, significantly affecting cultural heritage resources. The results might be complex as a consequence of the direct and indirect impacts of several climatic and non-climate elements. Furthermore, the system's sensitivity to climatic fluctuation and change alters the amount of effect, and the risk involved is defined by the chance of the risk occurring. How vulnerable society and the environment are to climate change depends on how sensitive the system is and how well it can respond.

The first step in assessing vulnerability in the cultural landscape is to define the scope of the proposed assessment. This means deciding what issues are important and how the assessment will be done. This scoping work aims to focus on important questions and problems and make the best use of limited resources. The IPCC has laid out a general plan for scoping and defining the problem (IPCC, 1992). Carter and de Rozan (Carter and Blantran de Rozan, 1993) and the IPCC outline make it possible to describe the steps that can be taken to figure out the right scope of an assessment. In the cultural landscape, the first step to assessing vulnerability is to define the scope of the proposed assessment, including the issues of interest and the assessment process to be used.

This scoping effort aims to focus on significant questions and issues and use limited resources efficiently. The IPCC has outlined a general approach for scoping and problem definition (IPCC, 1992). The IPCC outline and Carter and de Rozan (Carter & Blantran de Rozan, 1993) make it possible to describe the steps that can be taken to determine the proper scope of an assessment. The steps consist of (1) selecting the study region, (2) determining assessment objectives, (3) defining sectors to be studied, (4) determining data requirements, (5) selecting the time frame, (6) developing the context for assessment, and (7) develop a schedule.

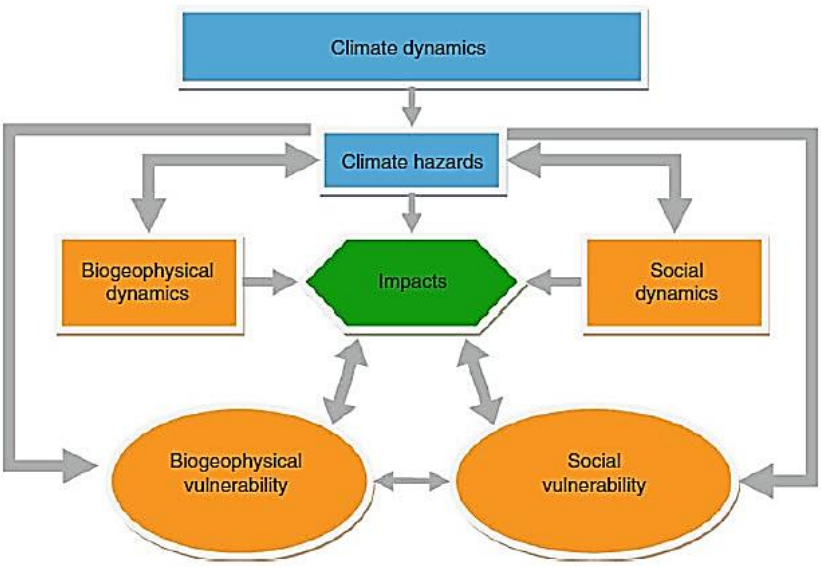

Figure 3.1. A theoretical framework for identifying and choosing indicators (Agnew, 2013).

3.3.1 Select the study region

The selection of the study region is driven by the assessment's objectives and the selected sectors. The most important aspects of cultural landscapes are:

- Administrative units (e.g., district, town, province, state, and nation). These units are beneficial for addressing social and economic concerns. They are also convenient due to well-defined borders.
- Geographical regions (e.g., river basin, plain, mountain range, and lake regions). The evaluation in these units focuses on topics strongly connected to physical and biological perspectives. The same sort of effects may be observed throughout the unit.
- Ecological zone (e.g., wetland, forest, moorland, and savannah). These units are useful for studying the effects on a particular biological population.

- Climatic zone (e.g., desert, monsoon zone, and rain shadow area). These regions are anticipated to see similar patterns of climate change.
- Sensitive areas (e.g., tree lines, ecotones, coastal zones, ecological niches, and marginal communities). These regions may be particularly susceptible to climate change. Due to the sensitivity of these regions, the earliest signs of consequences may appear there.

In terms of climate change, the study of the cultural landscape may be chosen by careful analysis of the available data, which includes both physical and socioeconomic information.

3.3.2. determine assessment objectives

According to the IPCC, the overarching goals of a climate change risk and adaptation assessment are to:

- evaluate how climate impacts human activities and natural systems and quantify the uncertainty of these effects;
- evaluate the sensitivities, thresholds, and vulnerabilities of natural systems to plausible climate scenarios; and
- identify potential adaptation and policy solutions.

These goals define broad objectives for an assessment. More detailed, country-specific goals also need to be identified. So, the following issues need to be considered:

- Determine who will utilize the assessment results. Heritage managers, for example, may utilize the study to assess climate change adaptation measures. The findings might be used to establish research goals by the scientific community. The findings might also help with international climate change cooperation initiatives. Each of these objectives may need various research and assessments of cultural landscapes.
- Determine what information the assessment should produce. It is critical to examine what sort of information would be most beneficial to site managers. This information will aid in determining the type of analysis and the level of detail.
- Decide the quantity of information required for vulnerability assessment. The target outcome of the evaluation should be determined. A reasonably basic analysis technique may be utilized to create a first-order assessment of the magnitude of climate change impacts and to develop conservation plans for more extensive investigations. If the

investigation is a follow-up research to another, more extensive work and more rigorous analysis are required.

- Setting territory objectives early in the process is critical to guarantee that limited resources are allocated efficiently.

3.3.3. Define sectors to be studied

The third phase of the scoping procedure is to identify the sectors in the region that are most vulnerable to climate change and will have the greatest impact on the people and economy. The following questions might be answered when attempting to determine if an area should include a certain sector in a vulnerability and adaptation assessment:

- Does the sector play a significant role in the cultural landscape and the system of the region? Some examples of this include agriculture as a significant (or insignificant) contributor to GNP, large (or limited) low-lying coastal areas, and extensive (or restricted) natural forest areas.
- Are there any signs that the sector is particularly sensitive to changes in the weather? Some examples are crops that are sensitive to changes in the amount of rain, areas along the coast that flood often, and water supplies that are not very reliable or stable right now.
- Would a change in the sector caused by climate change have a significant effect on people's lives or on the economy?
- Is there a short- or medium-term benefit to taking some steps to deal with the effects of climate change on the sector?

If a conservation sector can answer "yes" to these questions, the issue should be considered for a vulnerability and adaptation assessment. It would also be helpful to rank the sectors by how important they are to the issue of vulnerability and adaptation so that work can be done on the most important sectors.

3.3.4. Determine data requirements

The availability of data must be taken into account in all scope decisions I have talked about so far. If there is not enough reliable information to use as the basis for an evaluation, it is not necessary to do complex quantitative analysis. Before starting a vulnerability assessment in any of the sectors, countries should consider these data needs and see if they have access to the

information they need. Also, the analytical technique to be used in a vulnerability assessment in any sector must be chosen based on whether the quality of the available data justifies the use of the technique. In the case of natural heritage sites, for example, agricultural crop computer simulation models should not be used if there is not enough information about the type of soil, the weather in the past, and the plants that are already there. In places with little data, it may be better to use techniques that do not involve simulation.

3.3.5. Select the time frame

Most vulnerability and adaptation assessments are done over a long time (20–100 years) because many of the effects are not expected to be clear or essential immediately. However, thinking about short-term problems (5-10 years) is also essential. Consideration needs to be given to adaptation strategies that can be put into place quickly but will help solve long-term problems. For example, if an analysis shows that rising sea levels in coastal areas will flood large areas and it is decided to build seawalls to deal with the problem (like in Venice), planning and implementing these steps must start early.

3.3.6. Develop the context for the assessment

The next step in the scoping process is determining how the assessment fits into the bigger picture. This activity includes finding other work (either finished or in progress) that could support the assessment, putting together a well-coordinated and well-managed project, and figuring out how well the results will fit in with other work once the assessment is done. These things help decide what role the assessment will play in how decisions are made in the region.

Identifying "stakeholders" in the outcome of the assessment is very important. Some people in the community participate in the assessment process, either directly or indirectly. This group includes policymakers, climate researchers, government officials, educational leaders, non-government organizations, and the general public. Each of these groups might care about the work in a different way. When making the scope of the assessment, the interests of stakeholders should be taken into account as much as possible. When addressing the interests of the stakeholders, it is important to think about the following:

- Their input will be requested for the evaluation
- The findings of the assessment will be communicated to them.

In each country and location, it will be necessary to approach these concerns in a unique manner. In some circumstances, a region may seek to assemble a formal advisory council comprised of members from each interested organization. This committee can be informed on the sort of evaluation to be conducted, the methodology to be utilized, and the anticipated outcomes. Throughout the evaluation, the committee might convene periodically to discuss interim results and offer input to the analysts.

Alternately, each stakeholder group might be approached independently to elicit input on the evaluation and gain feedback on the outcomes. Regardless of the approach employed, the analysis must be exposed to a wide variety of stakeholders and decision-making groups. The capacity of a cultural landscape to execute the vulnerability assessment's recommendations will be bolstered by establishing a broad base of input.

3.3.7. Develop a schedule

Table 3.2 shows a sample schedule for assessing a cultural landscape. This schedule should be used as a general guideline and should be changed to fit the needs of each region.

In this model, it would be important for planning institutions, stakeholders, and researchers to talk to each other and share information to develop policies for natural and cultural heritage sites that would help them adapt. This communication keeps heritage sites safe from climate change and prepares cultural landscapes for natural disasters (Shirvani Dastgerdi et al., 2019a).

Step	Action
1	Define the scope of the problem and the assessment process and methods.
2	Select and develop scenarios.
3	Conduct vulnerability and adaptation assessments for each conservation sector.
4	present a region-wide workshop on preliminary vulnerability results and discuss integration and adaptation options.
5	Integrate results across heritage sectors and analyze the adaptation policy, including presenting an adaptation workshop
6	Prepare a vulnerability and adaptation report and present the findings for review.
7	present a workshop in the territory on results.
8	Complete the results and report.

Table 3.2 Example of a Timeline for a Vulnerability and Climate Risk Assessment

3.4. vulnerability assessment of world heritage sites in the face of climate change

According to the IPCC, the unprecedented pace of global temperature increase observed during the twentieth century is the highest in the past millennium, with human activity accounting for the majority of this increase (Cassar et al., 2006). The exclusion of cultural heritage from climate discourse has a practical, correlative reality: while the culture and heritage sectors are major institutions in most communities, they are frequently not actively engaged in climate action activity (ICOMOS, 2019b). The World Heritage Centre surveyed all State Parties to the World Heritage Convention in 2005 to examine the consequences of changing weather patterns on World Heritage sites. According to the comments gathered, climate change has influenced 72 percent of the tested nations' natural and cultural heritage sites. Out of 83 nations, 46 stated they were taking concrete efforts to address the issue. However, the majority of these actions were confined to monitoring the effects. Thirty-nine nations stated that specific research was being conducted. Forty-nine states also reported that political support was being mobilized, but this was frequently in the form of awareness-raising activities. Climate change has been identified as a hazard to 125 World Heritage Sites. Seventy-nine of these examples were natural-mixed landscapes (Fig. 3.2).

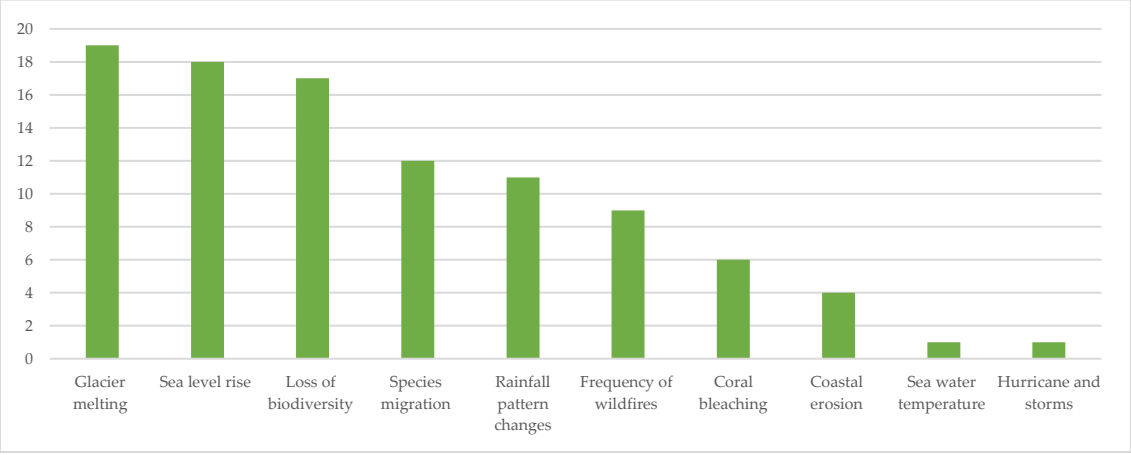

Figure 3.2 The climate change impacts observed for natural World Heritage properties, derived from (Cassar et al., 2006).

Climate change has been identified as a threat to 46 Cultural World Heritage sites. Almost all of the cultural sites cited were "man-made structures," such as archaeological remains, churches, mosques, or temples, with only four referring to cultural landscapes (Fig. 3.3).

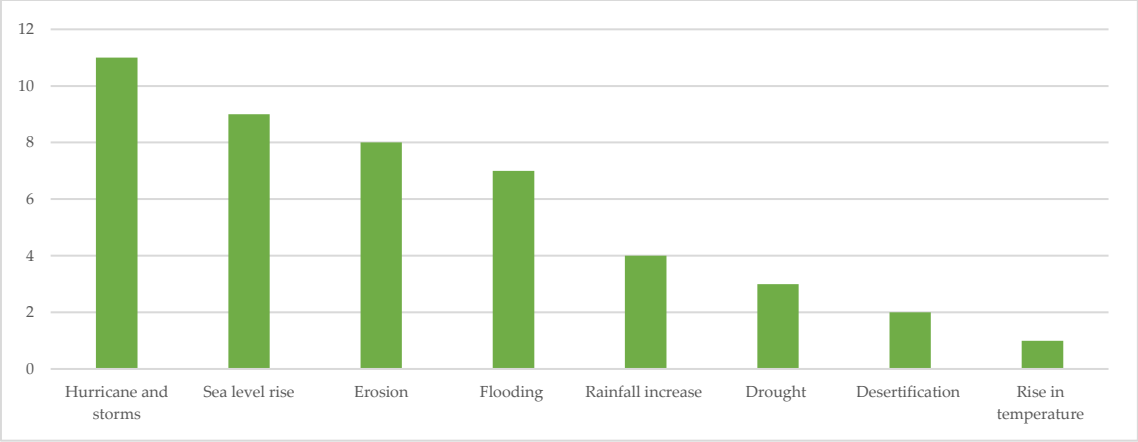

Figure 3.3 The climate threats raised for cultural world heritage sites, derived from (Cassar et al., 2006).

Environmental and biological changes considerably influence ecosystem functioning and the supply of ecosystem goods and services, severely affecting human lives. As a result, socioeconomic activities such as agriculture, fishing, and tourism are being influenced, for example, by changes in freshwater availability. The combination of climate change and other global forces, such as land-use change, can potentially intensify negative consequences on people and the environment. Weather patterns will influence a wide range of biomes in terms of terrestrial biodiversity. The yearly melt of Himalayan glaciers also influences the region's hydrological cycles. However, when the ice melts, floods will occur first, followed by a lack of water supplies, leading to starvation and pandemic illness. The rising ocean temperature endangers numerous marine species, including coral reefs, which dwell at their top thermal limit in many regions.

Historical monuments were built for a specific local climate and were closer to the earth than modern structures. They are more porous, drawing water from the ground and losing it to the environment via surface evaporation. Increases in soil moisture may result in more salt mobilization and, as a result, harmful crystallization on decorated surfaces due to drying. Timber and other organic materials may be exposed to increasing biological infestation, such as insect migration in altitudes and latitudes where such risks were not previously present. Rising sea levels threaten many coastal areas. Furthermore, when soil temperatures rise, the circumstances for the preservation of archaeological evidence may deteriorate.

Type		Case Study	Climate change Impact	Additional Stress
Natural	Glaciers	Sagarmatha Park, Nepal	Sudden and violent flooding in the downstream valleys Geological and hydrological impacts Threatening mountainous ecosystems and terrestrial biodiversity	locally triggered pressures Resource and development pressures the long-term conservation challenge and necessity for management solutions at the local level
		Huascarán National Park, Peru		
		Ilulissat Icefjor, Denmark		
		Kilimanjaro National Park, United Republic of Tanzania		
		Jungfrau-Aletsch-Bietschhorn, Switzerland		
	Marine Biodiversity	Great Barrier Reef, Australia	Changing migratory patterns Shifting community composition Changing ecosystem functioning.	58% of coral reefs are considered at risk of episodic natural events and human activities.
		Sundarbans, India, Bangladesh		
		Komodo National Park, Indonesia		
	Terrestrial Biodiversity	Cape Floral Region, South Africa	The extinction of local, regional, and global species due to range expansions, contractions, and eliminations. Altering in the phenology, nutrient cycling, and availability of natural resource	Strengthening risk preparedness, such as fire seasonality forces of change in land use The necessity for formulating feasible proactive regional-scale management initiatives
		Greater Blue Mountains, Australia		
		Ichkeul National Park, Tunisia		
		Wet Tropics of Queensland, Australia		
		Area de Guanacaste, Costa Rica		
Cultural	Archaeological	Chan Chan Zone, Peru	The increasing frequency of droughts or floods and changes in water-table levels, humidity cycles, time of wetness, groundwater, and soil chemistry	Inducing crystallization and dissolution of salts, thus affecting buried archaeology as well as wall paintings, frescos, and other decorated surfaces, including rock art.
		Ivvavik/Vuntut/Herschel Island, Canada		
		Chavín, Peru		
		Golden Mountains of Altai, Russian Federation		
	Historic Cities	The city of London, United Kingdom	Desertification and salt weathering Coastal erosion Structural damage due to Increases in the wind. Post flooding and growth of damaging micro-organisms such as fungi.	abandonment of property break-up of communities The need for a strategic shift from a reactive to a proactive approach The eventual loss of rituals and cultural memory.
		Venice and its Lagoon, Italy		
		Cesky Krumlov, Czech Republic		
		Timbuktu, Mali		
		Ouadi Qadisha, Lebanon		

Table 3.3 Impacts of climate change on world heritage sites derived from (Colette, 2007).

Increased wind and storm activity can cause structural damage, and salt weathering and erosion will endanger cultural property in desertic locations like Mauritania's Chinguetti Mosque. Aside from these physical risks, climate change will influence social and cultural dimensions, with societies adjusting their lifestyles. Many World Heritage sites are living entities that rely on their communities for survival and upkeep.

Climate change poses a serious threat to the long-term conservation of historic values. However, this threat must be viewed as one among several. At each site, several challenges necessitate active management solutions at the local level, such as water stress, which has a wide-ranging impact on biodiversity and people. As a result, many heritage sites' resistance to climate change can be considerably increased by mitigating the effects of other pressures. Table 3.3 details the impact of climate change on both natural and cultural heritage assets and the extra source of stress for each. The many types of dangers, strains, and problems connected with putting general policies into effect highlight the basic necessity for traditional heritage policies to be reconsidered. Climate activists and heritage policymakers must increase their awareness of priority activities, involve local people, and collaborate with scientists and scholars on the intersections to reduce the added burden on cultural heritage places.

3.5. Impact of climate change on the way we think about the cultural landscape

Climate change creates several challenges in the framework of the convention, which are crucial for the convention's future implementation. Heritage sites are inscribed on the World Heritage List if they fulfill at least one of the criteria for exceptional universal significance and also meet the integrity requirements (World Heritage Committee, 2017, paras. 77–78, 87–95). Currently, a site can be put on the List of World Heritage in Hazard if a significant and particular danger endangers it - both actual and potential dangers. The convention also states that if a property loses the features that led to its inclusion on the World Heritage List, it can be delisted. As a result, climate change raises a crucial challenge within the context of the convention's legal framework, with the perception that its potential remarkable universal value may vanish owing to its physical and socioeconomic repercussions. As a result, it is necessary to review whether the methods provided in the present Operational Guidelines for World Heritage Convention Implementation are adequate.

3.6. Conservation of cultural landscapes in the face of natural hazards and climate change

In recent years, the frequency of natural disasters has increased dramatically. In 2018, 289 natural disasters affected 61,7 million people and claimed the lives of 10,733 people. Ninety percent of disaster victims perished as a result of climate change risks like storms, hurricanes, and flooding (Center for Research on the Epidemiology of Disasters (CRED)., 2018). As natural hazards become more prevalent, it is anticipated that the number of individuals at risk will change, as will the economic costs associated with catastrophe severity and recurrence. Multiple dangers can contribute to the occurrence of a catastrophe. Several factors contribute to the occurrence of a disaster, including the nature of the hazard, the degree of human exposure, the vulnerability of the landscape, and the capacity to mitigate or manage the potential damage. If social and economic development is to be sustained over the long term, "disaster risk reduction" and "resilience" are indispensable actions. In order to promote resilience, urban planning, and design must incorporate resilience thinking. Numerous policy documents, such as the Hyogo Framework for Action 2005–2015 and the Sendai Framework for Disaster Risk Reduction 2015–2030, emphasize the necessity of implementing this integration. It is unclear, however, how resilience thinking will impact urban planning theory and practice (Sharifi & Yamagata, 2018a).

Changing weather patterns are primarily a threat with physical consequences. It impacts cultural and natural heritage through temperature changes, soil erosion, flooding, storms, melting glaciers, and changes in habitat (UNESCO, 2009). It can also force populations to migrate, resulting in the disintegration of communities, the abandonment of property, and the ultimate eradication of rituals and cultural memory. This abandonment is a significant concern for the preservation of cultural heritage in contexts where traditional knowledge and skills are necessary to ensure the proper maintenance of these properties (Colette, 2007). As an international organization, UNESCO also faces institutional challenges in the context of climate change, which necessitate closer cooperation between the various Programme Sectors[1] (World Heritage Centre, 2006), and therefore, a more determined reaction by UNESCO to climate change is wanting (Francioni & Lenzerini, 2008).

By introducing new pressures and risks to the management of cultural landscapes, climate change poses a significant threat to cultural heritage conservation (ICOMOS, 2019a). Climate change-

[1] Like education, sciences, culture, and communication and information sectors.

related trends and extreme events can threaten the tangible and intangible features of these landscapes (Harkin et al., 2020) and have impacted cultural landscapes in a variety of ways in recent years (Fatoric & Seekamp, 2017), such as the sea-level rise in Venice (Ivajnšič et al., 2018); flood and coastal erosion in Mediterranean UNESCO World Heritage Sites (Reimann et al., 2018); and changes in soil and sediment conditions in Cyprus's Paphos area (Cuca & Agapiou, 2018).

According to the Intergovernmental Panel on Climate Change (IPCC), adaptation to climate change includes: "Climate adaptation is the process of adjusting to the actual or predicted climate and its effects. Adaptation in human systems aims to mitigate harm or capitalize on favorable opportunities. Human intervention can facilitate adaptation to anticipated climate and its consequences in natural systems" (IPCC, 2018, p. 1758). Adaptation to climate change may be addressed at international, national, and local levels (Allen et al., 2018a); Urban areas and megacities have implemented a variety of responses to the effects of climate change (Georgeson et al., 2016b).

Climate change causes direct harm to the materials and structures of historic structures (Bertolin, 2019) and endangers the status of Outstanding Universal Value at many World Heritage Sites (Perry & Falzon, 2014a). For example, the United Kingdom Climate Impacts Programme (UKCIP) estimates that the Thames Estuary will experience a sea-level rise between 0.26 and 0.86 m by the 2080s, compared to its average level between 1961 and 1990 (Hulme et al., 2015). This rise in sea level and predicted changes in storm patterns pose a significant threat to the Outstanding Universal Value of three London World Heritage sites: the Tower of London, the Palace of Westminster, and Maritime Greenwich (Colette, 2007). In addition, climate change has indirect effects, as extreme weather events reduce the number of tourists (Markham et al., 2016a) and disrupt socioeconomic activities in cultural landscape areas (ICOMOS, 2019a). For instance, climate change is expected to reduce the number of annual visitors to Mesa Verde National Park in the United States, which currently attracts approximately 500,000 tourists annually and contributes approximately US$ 47 million to the local economy (Holtz et al., 2014).

Adaptation, as defined by the Intergovernmental Panel on Climate Change (2014), is the process of adjusting to the actual or anticipated climate and its consequences. Adaptation in human systems seeks to mitigate or avoid harm or exploit advantageous opportunities (IPCC, 2014a). Climate adaptation refers to the measures taken to mitigate the effects of climate change by decreasing

vulnerability and maximizing opportunities. Indeed, these actions can potentially reduce government barriers and foster an environment in which the private sector can invest in renewable energy and develop carbon-free business strategies (Tsitsiragos, 2016). Many cities and megacities have enhanced their adaptation capacity through policymaking and developed adaptation measures to reduce their vulnerability to climate change's effects (Georgeson et al., 2016a). Building adaptation capacity may be defined at different levels (i.e., international, national, or local), and subnational jurisdictions are essential for enhancing measures to reduce the risks of climate change (Allen et al., 2018b). The adaptation capacity of each region is crucial to the long-term effectiveness of adaptation policies (Siders, 2019). The challenge for emerging insights into adaptation is identifying genetic determinants of adaptive capacity at different scales to construct models of its future evolution (Vincent, 2007).

Climate-related risks, such as mudslides, substantially threaten cultural resources (UNESCO, 2008). Proper comprehension of climate impacts on heritage resources provides a solid foundation for formulating and developing adaptation policies and reduces the costs associated with climate change (Galeotti and Roson, 2012). Adaptation of heritage resources necessitates a multidisciplinary framework that adequately addresses the complex interactions between climate, physical, social, and ecological systems (Shirvani Dastgerdi et al., 2019a). Future opportunities for adaptation pathways may be hampered by delayed action in the present (Denton et al., 2015). Many experts and researchers on cultural heritage in Europe believe that adaptation of heritage resources to climate change is feasible. The opportunities, barriers, and requirements for adapting cultural heritage to climate change, as perceived by the interviewees, improved understanding of what must be implemented and prioritized for adaptation (Sesana, Gagnon, et al., 2018b).

3.7. International documents of twenty century for the conservation of cultural heritage

Throughout the twentieth century, and particularly during its second half, many official documents, such as conventions, recommendations, declarations, and charters, were issued in response to conferences, symposia, and sessions of the foremost international bodies responsible for World Heritage protection. UNESCO's standard-setting instruments include conventions, recommendations, a declaration, and charters. Article IV, paragraph 4, of UNESCO's constitution and Resolution 33 C/87, which the General Conference passed at its 33rd session, set the rules for how they can be made, reviewed, adopted, and followed up on. Throughout the process stages,

this framework involves the General Conference, the Executive Board, the Director General, special committees of government experts, and the Member States. [2]

Each tool for setting standards serves a different purpose and is only valid for certain Member States. States must generally ratify, accept, or join an international convention before it comes into force. They spell out rules that the States agree to follow. Recommendations are rules that do not have to be signed, but Member States are asked to follow them. Declarations are another way to say the rules but do not have to be ratified. Like recommendations, they set out universal principles that the community of states wanted to be authoritative and have as much support as possible. They also put much weight on moral authority (General introduction to the standard setting instruments of UNESCO). There is not much difference between Recommendations and Declarations within the United Nations. However, a "declaration" is sometimes a more formal and solemn document used when principles of great and long-lasting importance are stated.[3]

These official documents show the most important ideas about preservation and conservation at the time they were written, as well as what has been done in the real world. Some are considered the beginnings of the modern preservation movement as a whole and, as such, are landmarks. Others are thought to be the current UNESCO legal framework for urban conservation (181 EX/29). Some documents talk directly about the idea of historic towns and urban heritage, while others make vague references to it. Overall, they call for the protection of a single monument and its historic surroundings. This is to avoid situations in which "historical relations and the setting of historic quarters are destroyed" (1968 UNESCO Recommendation on Public or Private Works, Article 8(a)).

Table 3.4 lists the most important historic urban landscape documents of the twenty century. The documents examined in Table 3.4 range from the 1931 Athens Charter for the Restoration of

[2] General introduction to the standard setting instruments of UNESCO (http://portal.unesco.org/en/ev.php-URL_ID=23772&URL_DO=DO_TOPIC&URL_SECTION=201.html). Both International Convention and Recommendation are defined by the Rules of Procedure concerning recommendations to Member States and international conventions covered by the terms of Article IV, paragraph 4, of the Constitution, were adopted by the General Conference at its 5th session, and amended at its 7th, 17th, 25th, 32nd and 35th sessions (1).

[3] http://portal.unesco.org/en/ev.php-URL_ID=23772&URL_DO=DO_TOPIC&URL_SECTION=201.html

Historic Monuments to the 2000 "Machinami Charter" of ICOMOS Japan. These documents stress the importance of protecting our historic cities and the qualities that make them unique. Local communities, called "local residents" or "town inhabitants" in the documents, are seen as one of the most important parts of historic towns and historic areas by the experts who helped write the documents. Understanding the complexity of inhabited towns requires understanding the relationship between the social structure and the spatial structure of the urban fabric, as well as the effects of constant change and rapid development on these kinds of cultural properties. This idea is not that old, but it is still getting a lot of attention on the international, regional, and local levels.

EARLY DECADES OF THE TWENTIETH CENTURY		
	1931	The Athens Charter for the Restoration of Historic Monuments
PRE-1972 WORLD HERITAGE CONVENTION		
1960s	1962	UNESCO Recommendation Concerning the Safeguarding of the Beauty and Character of Landscapes and Sites
	1964	The Venice Charter International Charter for the Conservation and Restoration of Monuments and Sites
	1968	UNESCO Recommendation concerning the Preservation of Cultural Property Endangered by Public or Private Works
THE 1972 WORLD HERITAGE CONVENTION		
1970s	1972	UNESCO World Heritage Convention Concerning the Protection of the World Cultural and Natural Heritage
	1975	ICOMOS Resolutions of the International Symposium on the Conservation of Smaller Historic Towns
	1975	Council of Europe, European Charter of the Architectural Heritage
	1975	Council of Europe, The Declaration of Amsterdam
	1976	UNESCO Recommendation concerning the Safeguarding and Contemporary Role of Historic Areas (Nairobi Recommendation)
1987 AND THE SECOND HALF OF THE 1980S		
1980s	1985	Council of Europe Convention for the Protection of the Architectural Heritage of Europe
	1987	ICOMOS Brazil, First Brazilian Seminar about the Preservation and Revitalization of Historic Centers (ICOMOS Itaipava Charter)
	1987	ICOMOS Charter for the Conservation of Historic Towns and Urban Areas (Washington Charter)
THE TURN OF THE TWENTIETH CENTURY		
1990-2000	1999	ICOMOS Charter on the Built Vernacular Heritage
	2000	Charter for the Conservation of Historic Towns and Settlements of Japan (The Machinami Charter)

Table 3.4 The most important documents for the conservation of historic urban landscape in the twenty century

3.8. The evolution of approaches for the conservation of cultural heritage

An evolving process in the preservation of historical fabrics can be seen by reviewing global preservation charters. Following the 1964 Venice Congress, urban restoration entered a new phase, with monuments becoming more integrated into the urban fabric. The provisions of Venice's charter's paragraphs one, six, and seven represent the same vision (Icomos, 1964). One of the main goals of urban planning at the time was to recognize preservation principles in urban development plans. The direction of the preservation movement has been to profitable use of historical buildings since the late twentieth century, thanks to the development of rules, regulations, and instructions policy guides for planning influenced by economic trends (Feilden & Jokilehto, 1993). In this regard, the Washington Charter of 1987 emphasized the importance of preservation as part of coherent economic and social development in urban and regional planning.

Early in the twenty-first century, preservation documents were created to explain and promote the historic environment's role in the urban revitalization process. In addition, it has been emphasized that the private sector should be encouraged to invest in the revitalization of the historic environment, that historical buildings should be used economically, and that preservation should be viewed as a source of long-term and stable employment compared to the construction of new buildings, that development agencies and participatory companies should be involved, that tourism is an effective factor in urban rehabilitation, and that people should be involved in part. Table 3.5 summarizes the evolution of international experience in the preservation of historical fabrics.

Year	Convention	Conservation approaches
1964	Venice	Promote the concept of heritage from individual buildings to urban spaces. The necessity to preserve of surrounding physical context of historical buildings. Intervention based on evidence.
1975	Amsterdam	The inclusion of intervention plans into the urban master plans. Considering the budget for the implementation of projects. The necessity of the participation of the whole society. Promotion of education at all levels. Simultaneously paid attention to the buildings and fabric.

		Proposes strategies for reducing the local population mobility
1987	Washington	Conservation as part of economic development policies
1992	Maastricht	Public participation in conservation. Sustainable development and the preservation of heritage.
1994	Nara	Gentrification to values and local heritage.
1999	Burra	Conservation and development based on respect to the meaning of places. A conscious approach to necessary changes.
2000	Mexico	The extensive and continuous need for the preservation of local heritage.
2003	Hoi An	Participation of local communities in the conservation and renewal of historic neighborhoods. Integration of tourism development and preservation of heritage.
2003	Intangible Cultural Heritage	Dependency between tangible and intangible cultural heritage. Preservation of intangible cultural heritage. Raising awareness of local, national, and international importance of intangible heritage.
2007	Verona	Considering local culture for renewal of the heritage. Community participation and considering private sector capital.
2008	ICOMOS	Proper use of heritage for sustainable economic and social development. Introduced cultural communication as a new conservation approach.

Table 3.5. Evolution of international protection charters of historical fabrics.

3.9. The traditional definition of cultural heritage based on the UNESCO Convention of 1972

The World Heritage Convention has been in effect since 1975 in order to preserve and transmit the cultural and natural heritage of outstanding universal value to future generations. The most important criterion for the inclusion of cultural and natural properties on the World Heritage List is that they meet the criteria of outstanding universal value (OUV), which are evaluated through a rigorous evaluation process by the Advisory Bodies of the Convention (World Heritage Centre, 1972). This concept, however, has been criticized by scholars from various perspectives (Shirvani Dastgerdi & De Luca, 2018b), including the implemented method for defining the exceptional universal value (Cleere, 1996) or cultural values (Shirvani Dastgerdi & De Luca, 2018a), the criteria for measuring genuineness and honesty (Stovel, 2007), the effectiveness of management plan (Tomlan, 2015), the image quality of a location (Shirvani Dastgerdi & De Luca, 2019a, 2019e) and the perceptions and satisfaction of tourists regarding a World Heritage Site (Poria et al., 2013). Conservation of world heritage sites has also been accompanied by a number of

obstacles, such as globalization impacts (Shirvani Dastgerdi & De Luca, 2019d), Damaged by significant escalations in armed conflict (Alsalloum, 2019), and alteration of the historic landscape as a result of spatial transformation (Shirvani Dastgerdi & De Luca, 2019c, 2019b). Many conventions, charters, and guidelines have been developed over the years by UNESCO and its advisory bodies[4] to better correspond to the perception of cultural heritage and to evolve conservation policies (World Heritage Centre, n.d.-a).

The meaning of the term "cultural heritage" varies based on the background and interests of the individuals using it. It may be material or immaterial, movable or immovable, ancient or modern, held privately, communally, corporately, or not at all. Also possible is a combination of these qualities. In the UNESCO convention of 1972, cultural heritage is made up of two parts: 1) tangible features, such as ancient monuments and landmarks, historical cities, or natural landscapes, and 2) intangible qualities, such as the region's folklore, traditions, knowledge, or vernacular (World Heritage Centre, 2016). Cultural heritage resources can enhance people's sense of community, improve their well-being and quality of life, and promote long-term economic growth (Daugstad & Jones, 1994; Jones, 2003a; Jones & Daugstad, 1997). By combining environmental, social, and economic considerations with cultural ones, cultural heritage conservation can help to meet many of the Sustainable Development Goals established by the United Nations (United Nations, 2015).

Articles 1 and 2 of the World Heritage Convention outline what constitutes "cultural heritage" and "natural heritage" for purposes of the convention. Consideration must be given to the following:

1. Monuments: architectural works, works of monumental sculpture and painting, elements or structures of an archaeological nature, inscriptions, cave dwellings, and combinations of features that are of outstanding universal value from the point of view of history, art, or science;
2. Groups of buildings: groups of separate or connected buildings which, because of their architecture, their homogeneity, or their place in the landscape, are of outstanding universal value from the point of view of history, art, or science;

4 The International Union for the Conservation of Nature (IUCN), the International Council on Monuments and Sites (ICOMOS), and the International Centre for the Study of the Preservation and Restoration of Cultural Property (ICCROM)

3. Sites: works of man or the combined works of nature and man, and areas including archaeological sites which are of outstanding universal value from the historical, aesthetic, ethnological or anthropological point of view (UNESCO, 1972a, Article 1).

Each of these categories pertains to "outstanding universal value" and the perspective from which this value is to be evaluated. For instance, groups of buildings - the category applicable to settlements - shall be regarded as having an outstanding universal value from a historical, artistic, or scientific perspective. In addition, they will be evaluated based on their architecture, homogeneity, and location within the landscape.

3.9.1. Process for nominating a historic landscape as a UNESCO World Heritage Site

In 1972 the UNESCO General Conference adopted the Convention Concerning the Protection of the World's Cultural and Natural Heritage, otherwise known as the World Heritage Convention. The rationale of the convention was that there are places of "outstanding universal value" (OUV), that these are part of the heritage of all humankind, and that their protection is, therefore, a shared responsibility. The most well-known result was the designation of cultural and natural properties as World Heritage Sites (WHS), which represent the pinnacle of international heritage standing. Sites were and continue to be evaluated based on nominations submitted by national governments. Sites are inscribed based on their "outstanding universal value" and "cultural and/or natural significance that is so exceptional that it transcends national boundaries and is of universal importance for present and future generations of all humanity" (UNESCO World Heritage Centre, 2015). For a site to be considered to have outstanding universal value, it must satisfy at least one of ten selection criteria, as well as tests of authenticity and the related concept of integrity, and demonstrate an adequate protection and management system. During the previous thirty years, the convention has been the most effective international legal instrument for promoting the protection of cultural and natural heritage (Strasser, 2002).

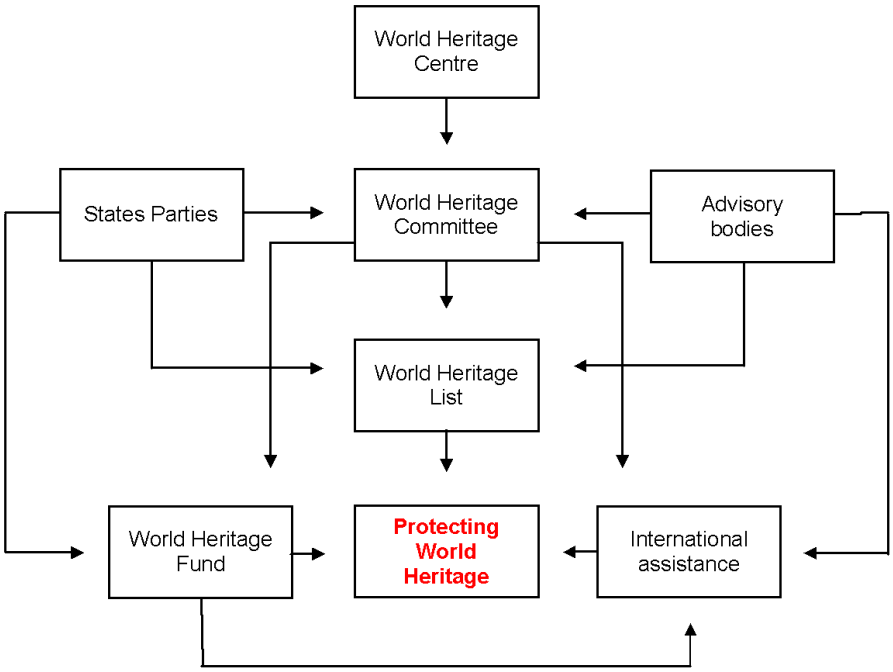

Figure 3.4 The protection system outlined in the World Heritage Convention

Inscription on the list signifies international attention, as well as appropriate protection and management, which would benefit designated sites by protecting their Outstanding Universal Values. There is intense competition among the state parties to include a portion of their heritage on the list. The benefits of increased economic activity that result from achieving this status are a clear motive for doing so. The World Heritage Convention establishes a framework for the collective protection of the cultural and natural heritage of outstanding universal value. This framework is depicted in Figure 3.4.

The world heritage convention is international in scope, but potential sites are nominated on a national level. A country is the only entity able to propose sites. The initial step is to compile a list of potential nominations for the next five to ten years. This list can be compiled by a single person or by various working groups and advisory councils. Only mayors, district governments, and heritage experts may propose additions to the tentative list. A site is officially nominated when a country submits a complete nomination document to the World Heritage Centre in Paris. This document should describe the nominated site, why it has outstanding universal value, how its quality compares to other more or less comparable properties, and how it is managed. The World Heritage Centre verifies the completeness of the information.

An expert from the World Conservation Union (IUCN) or the International Council on Monuments and Sites (ICOMOS) evaluates the site's quality based on whether it is natural or cultural. An expert evaluator writes a report on the site's quality and management and recommends its inclusion on the world heritage list. The World Heritage Committee makes the final decision, which consists of twenty-one rotating country representatives (see Appendix 2 for overview committee). Rarely has the World Heritage Committee's decision diverged from the IUCN or ICOMOS recommendation. Sites that have been referred back at any stage of the trajectory or rejected by the committee are eligible for re-nomination. This method is illustrated in Figure 3.5.

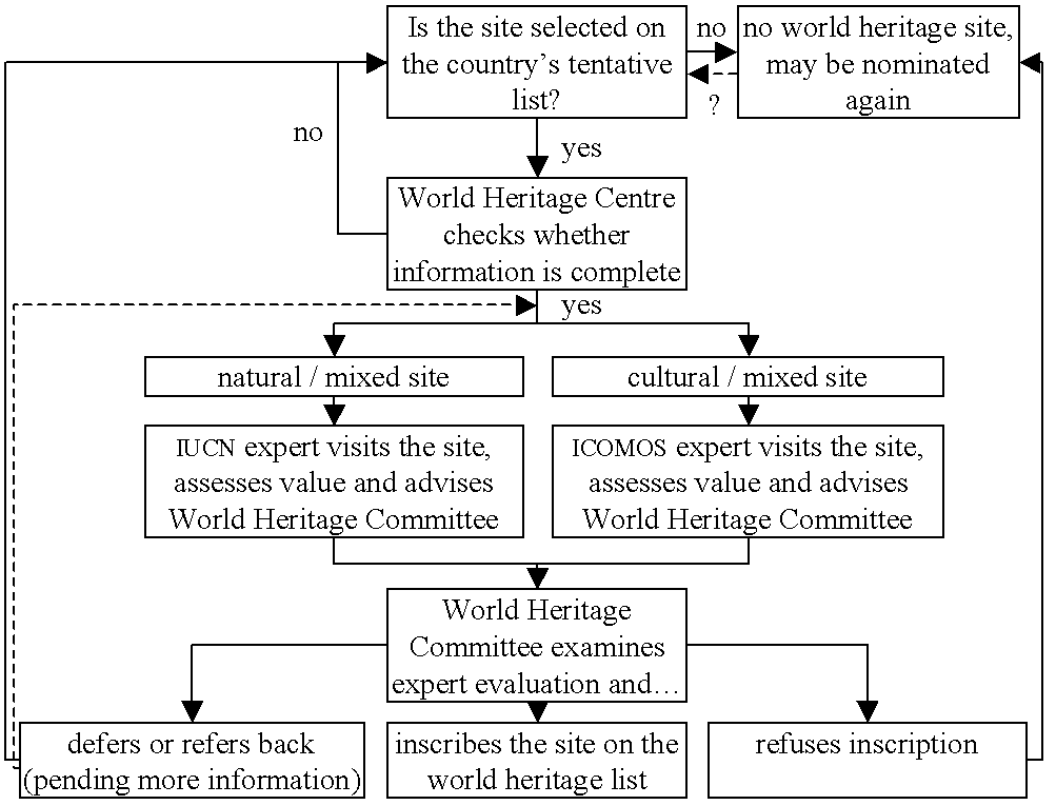

Figure 3.5 A schematic overview of the world heritage nomination procedure

3.9.2 How is a site designated as having Outstanding Universal Value?

The concept of "outstanding universal value" underpins the entirety of the World Heritage Convention and all activities associated with properties on the World Heritage List. Therefore, according to Titchen (1995), the concept of exceptional universal value has been constructed and refined over time. In the initial versions of the Operational Guidelines, it was believed that a property must meet one or more of the specified criteria and meet the conditions of authenticity

(in the case of cultural properties) or of integrity to be considered of outstanding universal value (in the case of natural properties). These criteria were modified several times over time, indicating that the concept of exceptional universal value also continued to evolve (Table 3.3).

i	represent a masterpiece of human creative genius	**Cultural Criteria**
ii	exhibit an important interchange of human values, over a span of time or within a cultural area of the world, on developments in architecture or technology, monumental arts, town-planning or landscape design;	
iii	bear a unique or at least exceptional testimony to a cultural tradition or to a civilization which is living or which has disappeared;	
iv	be an outstanding example of a type of building, architectural or technological ensemble or landscape which illustrates (a) significant stage(s) in human history;	
v	be an outstanding example of a traditional human settlement, land-use, or sea-use which is representative of a culture (or cultures), or human interaction with the environment, especially when it has become vulnerable under the impact of irreversible change;	
vi	Be directly or tangibly associated with events or living traditions, with ideas, or with beliefs, with artistic and literary works of outstanding universal significance. (The Committee considers that this criterion should preferably be used in conjunction with other criteria)	
vii	contain superlative natural phenomena or areas of exceptional natural beauty and aesthetic importance;	**Natural Criteria**
viii	be outstanding examples representing major stages of earth's history, including the record of life, significant ongoing geological processes in the development of landforms, or significant geomorphic or physiographic features;	
ix	be outstanding examples representing significant ongoing ecological and biological processes in the evolution and development of terrestrial, freshwater, coastal and marine ecosystems and communities of plants and animals;	

x	Contain the most important and significant natural habitats for in-situ conservation of biological diversity, including those containing threatened species of Outstanding Universal Value from the point of view of science or conservation.

Table 3.6 The Selection Criteria for World Heritage Sites (UNESCO World Heritage Centre, 2015)

In 2005, several significant modifications were made to the Operational Guidelines. One was that conditions of integrity formerly applicable only to natural properties were extended to cultural properties. In addition, a property must have adequate long-term legislative, regulatory, institutional, and/or traditional protection and management in order to be considered of exceptional universal value. In previous versions of the Operational Guidelines, protection, and management were regarded as listing requirements but not as part of the definition of outstanding universal value. The modifications made to the 2005 version of the Operational Guidelines stipulate that the concept of outstanding universal value is now defined by three pillars, as depicted in Figure 3.5, an IUCN-proposed diagram. Most importantly, for the very first time, there is a concise explanation of the concept that has been included, and it reads as follows:

> "*Outstanding universal value means cultural and/or natural significance which is so exceptional as to transcend national boundaries and to be of common importance for present and future generations of all humanity. As such, the permanent protection of this heritage is of the highest importance to the international community as a whole. The committee defines the criteria for the inscription of properties on the World Heritage List* (World Heritage Centre, 2005c, paragraph 49)".

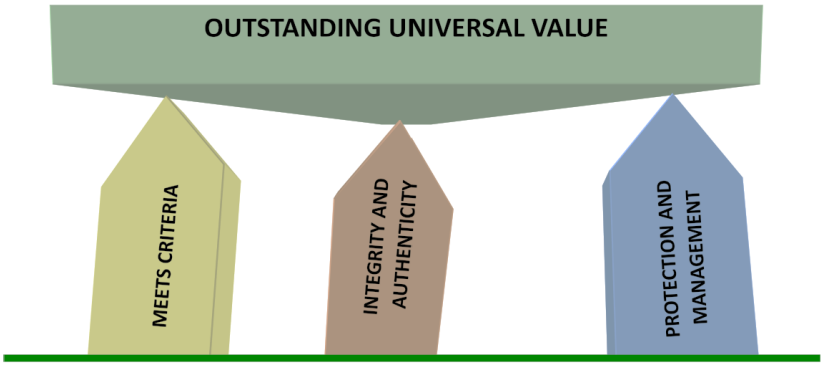

Figure 3.5 The Outstanding Universal Value's three foundational elements (as defined by IUCN)

It is now generally accepted that the idea is built on three pillars: criteria, conditions of authenticity and integrity, and requirements for protection and management[5] (Figure 3.3).

3.10. The emergence and development of the concept of the cultural landscape

The term "cultural landscape" is frequently associated with heritage studies, but its origins can be traced to a variety of disciplines. In 1893, German geographer Friedrich Ratzel defined cultural landscape (Kulturlandschaft) as a human-altered region (Potthoff, 2013). American geographer Carl O. Sauer (1925) introduced it to the English-speaking world as a natural landscape modified by a cultural group by emphasizing the role of culture in its formation (Sauer, 2007). In the 1960s, the term cultural landscape first appeared in the field of environmental management before being adopted by other fields, including archeology, history, planning, ethnology, and agriculture. All of these definitions have one thing in common: a cultural landscape illustrates the evolved interactions between a community and its natural environment and resources (Taylor & Lennon, 2011). According to Erv Zube (1931-2002), "landscape planning" is a process that assists people in deciding how to use the land while protecting natural processes and significant cultural and natural resources (Gobster, 2002).

In the 1990s, a number of international organizations adopted "cultural landscape" as a conservation category. UNESCO published "Operational Guidelines for the Implementation of the World Heritage Convention" in 1992, which classified cultural landscapes according to three tangible and intangible dimensions.

- Human-made cultural landscapes, such as natural parks, terraced gardens, and terraced terraces, comprise the first category.

[5] According to article 49 of the convention, Outstanding Universal Value means "cultural and/or natural significance which is so exceptional as to transcend national boundaries and to be of common importance for present and future generations of all humanity" (UNESCO World Heritage Center, 2019, para. 49). As a type of cultural landscape, World Heritage Sites prominently boost the economy of countries by attracting numerous domestic or international visitors (Shirvani Dastgerdi & De Luca, 2018b).

- The second type of landscape is one that has evolved through natural processes. They are comprised of both relict (or fossil) and active landscapes. The shape and composition of these landscapes illustrate this transformation process.
- The final category is the associations' cultural landscape. Not material cultural evidence, which may be negligible or nonexistent, justifies the inclusion of these types of landscapes on the World Heritage List (Fowler, 2003; World Heritage Centre, 2016, p. 19). A few years later, in 2000, the Council of Europe adopted the European Landscape Convention.

3.11. cultural landscape as social-ecological systems

Cultural landscapes can be understood as social-ecological systems (Kirchhoff et al., 2012). The cultural ecosystem is comprised of the concepts of cultural landscapes and socioecological systems, which both emphasize the interactions between human communities and nature (Selman, 2012). Nevertheless, social-ecological systems are much more closely related to resilience thinking and include issues such as nested systems, self-organization or adaptability, and nonlinearity (Berkes et al., 2008). Social-ecological systems (SES) theories capture the notion that nature and communities are inextricably interdependent and should be viewed as integrated, nested systems, a perspective that intuitively connects to our understanding of cultural landscapes (Shirvani Dastgerdi et al., 2020a). Since then, however, the SES framework has been expanded to encompass a variety of human-environment relationships. The SES framework recognizes explicitly that a social-ecological system is embedded within a larger context and is influenced by other social-ecological systems as well as social, economic, and political forces.

In line with this vision, the European Landscape Convention[6] defines a (cultural) landscape as any portion of the territory "as perceived by people, whose character results from the action and interaction of natural and/or human factors" (Council of Europe, 2000a, Chapter 1). UNESCO and the European Landscape Convention approach cultural landscape conservation differently. While UNESCO seeks to preserve only landscapes recognized internationally as outstanding heritage areas,1 the European Landscape Convention focuses on preserving landscapes that are valued nationally (Shirvani Dastgerdi et al., 2020b, 2019b) and seeks to enhance the quality of life in inland areas (Sargolini, 2013).

[6] Adopted by the council of Europe in Florence in 2000.

From a broader perspective, Plachter and Rossler (1995) define cultural landscapes as the result of "people's interactions with the natural environment over time and space" (Jones, 2003b). In each cultural landscape, heritage resources evoke historical identities and strengthen social cohesion (ICCROM, 2018). There is a strong connection, from a territorial planning perspective, between the proper conservation of heritage resources and the sustainability of cultural landscapes (Melnick et al., 2017; Morandi et al., 2012; Sargolini, 2015). Climate stability was frequently a factor in the development of cultural landscapes (Colette, 2007). However, global climate change – which is causing an increase in extreme weather events – has emerged as a major threat to the sustainability of many of these global resources (Fatorić & Seekamp, 2017a; Sabbioni et al., 2006).

3.11.1 Cultural landscapes and climate change

At its 29th session in 2005, the World Heritage Committee acknowledged climate change as a future threat to the preservation of numerous cultural and natural sites. In 2006, a report entitled "Predicting and Managing the Effects of Climate Change on World Heritage" marked the beginning of a new chapter in cultural heritage conservation (Cassar et al., 2006) as well as a "Strategy to assist states parties in implementing appropriate management responses" (Collete, 2007) presented at the 30th session of the World Heritage Committee in Lithuania. Nearly 50 climate scientists and World Heritage specialists, including representatives from the Intergovernmental Panel on Climate Change (IPCC), the United Nations Framework Convention on Climate Change (UNFCCC), the United Nations Environment Programme (UNEP), the World Resources Institute (WRI), and the Advisory Bodies to the World Heritage Convention, gathered at this meeting to discuss the effects of climate change (Colette, 2007).

Cultural landscapes should not be viewed as timeless regions. Rather, they are social-ecological systems that interact dynamically with their surroundings and make them susceptible to climate change (D. Harvey & Perry, 2015; Markham et al., 2016b; UNESCO, 2008). However, climate adaptation in the context of cultural landscapes is frequently absent from heritage planning, especially as it pertains to the integration of cultural and natural heritage (Sesana et al., 2020). Given the realities of ongoing climatic change, it is necessary to develop cultural heritage approaches and vulnerability assessment strategies to address the emerging and interconnected social and ecological conservation challenges posed by these changes. In a Dutch study, Fatori and Egberts (2020) described how cultural heritage resources may benefit from climate change adaptation measures. They described the informational, social, economic, aesthetic, and

environmental benefits of cultural heritage that support climate change actions. Among the social benefits of cultural heritage, for instance, are enhanced place-based identities and connections, which can foster social cohesion (Fatorić & Egberts, 2020). In addition, constructing adaptive capacity in a cultural landscape necessitates the incorporation of local community perceptions of cultural heritage and its value as a valuable resource, as well as an integral part of the local territory and identity. These factors will aid heritage planners in defining conservation priorities, assessing vulnerabilities, and directing funding more precisely (Shirvani Dastgerdi et al., 2020).

Recent empirical findings indicate that a lack of specific adaptation policies and climate vulnerability risk assessment tools for cultural heritage is one of the most commonly cited obstacles to implementing climate change adaptation in cultural heritage sites (Fatorić & Biesbroek, 2020a; Sesana et al., 2020). In addition, the successful implementation of climate adaptation strategies necessitates robust multisectoral and multilevel collaboration among a variety of stakeholders, including researchers, in order to advance knowledge and foster cooperation (Fatorić & Biesbroek, 2020b; Hollesen et al., 2018). Gupta et al. (2010) proposed an institutional strategy to boost adaptability. They contend that the availability of resources, governance structure, learning potential, leadership capacity, diversity of problem frames and solutions, and the capacity to change and grow are all effective climate adaptation factors (Gupta et al., 2010). In addition, the process of climate adaptation requires the active participation and engagement of local communities throughout the decision-making and implementation phases (Burton & Mustelin, 2013).

Sesana et al. (2020) discovered in their study of three cultural heritage sites in Italy, Scotland, and Norway that climate vulnerability assessment in cultural heritage sites must incorporate technical support, information, management, funding resources, communication, human resources, learning, and governance. Compared to top-down approaches, the bottom-up approach to assessing vulnerability provided a better understanding of the sensitivity of cultural heritage sites to climate change and the extent to which they can adapt to climate change in order to mitigate the damage it causes to cultural heritage. Their evaluation framework may facilitate the incorporation of climate change into cultural heritage policy.

There have been some local case studies that have analyzed the adaptive capacity of a particular region or a community (Engle & Lemos, 2010; Posey, 2009). These studies argue for the necessity

of assessing and measuring adaptive capacity at the regional or local level, where adaptation decisions are made. Smit and Pilifosova have classified adaptive capacity determinants into six categories: Economic Resources, Technology, Infrastructure, Information and skills, Institutions, and Equity (Smit & Pilifosova, 2003). It is generally agreed that economic assets, capital resources, financial means, and wealth play a significant role in adaptive capacity. By being able to shoulder the costs of adaptation, wealthy nations are more likely to be in a better position to adapt to climate change. Technological resources enable adaptation options; consequently, a lack of access to and development of technology can result in diminished adaptability. The existence and growth of infrastructure can serve as a foundation for the creation of adaptation options and measures. Access to information is likely to lead to the development of options for adaptation that are timely and appropriate if personnel are skilled, knowledgeable, and properly trained. Not only do well-developed institutions and governance structures have the capacity to address current challenges, but they also enable future planning. Finally, Equity has been considered a social sensitivity to climate change measurement tool (ESPON CLIMATE, 2010). Some studies also emphasize the importance of fostering communication between heritage institutions, academic researchers, and the local community in order to strengthen the adaptive capacity of cultural heritage sites (Bertolin, 2019; Sesana, Bertolin, et al., 2018). Communication is essential for climate change adaptation because it facilitates public engagement with climate change science and solutions in collaboration with governments, media organizations, businesses, and civil society (*Yale Program on Climate Change Communication*, 2020).

3.11.2. Cultural landscape protection based on community engagement

Sharing power, trust, adaptability, patience, transparency, and good governance are crucial factors for ensuring community participation in the implementation of conservation initiatives (Brown & Hay-Edie, 2014). Nonetheless, the socio-ecological participatory resilience process must comprehend the community's vision of all stakeholders, which can lead to conflicts as different stakeholders have varying levels of knowledge, priorities, and expectations. To address this issue, Giampieri et al. (2017) developed an Internet-based modeling framework to understand stakeholder perceptions of different scenarios for the Jamaica Bay watershed in New York. They conducted a series of standardized workshops with stakeholders in order to determine how diverse their resilience visions were. They concluded that future research must concentrate on training methods and engagement strategies that encourage meaningful stakeholder participation in

resilience (Giampieri et al., 2017). Furthermore, the dynamic nature of neighborhood and community perspectives on resilience constituted one of the most significant obstacles. Specifically, attitudes and perceptions of resilience vary over time, space, and between stakeholder groups. Additional efforts to include vulnerable and marginalized populations are essential for the planning and study of cultural heritage (Ramasubramanian, Menser, Rieser, Brezin, et al., 2016).

In their report for UNESCO titled "Climate Change Adaptation for Natural World Heritage Sites," Perry and Falzon (2014) stress that the participation of local and indigenous communities in climate change decision-making is a crucial aspect of initiating and implementing adaptation strategies for cultural heritage sites. In addition, they highlight the significance of Indigenous peoples' knowledge in climate change assessment and adaptation models, which climate scientists may overlook (Perry & Falzon, 2014b).

Participation in the community increases the socio-ecological resilience capacity. It assists decision-makers in comprehending the actual needs of communities and in developing a framework for two-way learning, which is essential for implementing programs promoting sustainability and resilience. It also supports the distinctive cultural values of each landscape (Ramasubramanian, Menser, Rieser, Feder, et al., 2016). For instance, Allred et al. (2016) used a social-ecological approach to comprehend resilience in Jamaica Bay, New York. By posing the question "resilience of what and for whom?" they demonstrated the importance of strengthening the relationship between the local community and researchers in order to protect socioecological systems (Allred et al., 2016, p. 44; Walker et al., 2006). Eiseman et al. (2020) created a volunteer training program for Northeastern United States climate stewards. Local community engagement in climate adaptation practice was found to be enhanced by techniques that foster a sense of community and self-efficacy (Eiseman et al., 2020).

From the perspective of urban and regional planning, there has frequently been a separation between cultural heritage sites and the surrounding nature in conservation practice (Sargolini, 2013). By isolating sites of cultural significance, traditional heritage conservation seeks to maintain the area in its original state. In contrast, territorial planning considers cultural, socioeconomic, and environmental conditions and priorities across a larger, regional landscape in order to inform decisions about sustainable development, land use, natural resource management, and conservation (McKenney et al., 2018).

3.12. cultural landscapes in the contexts of the 1972 convention and the European Landscape Convention

Cultural heritage was defined in 1972 by the United Nations Educational, Scientific, and Cultural Organization (UNESCO) as monuments, groups of structures and sites, works of man, integrated works of nature and man, and archaeological sites. In 1992, the term "cultural landscape" was added to this concept to encompass natural and human-created artwork (World Heritage Centre, 1992). Since the 1990s, the cultural landscape has been widely utilized in cultural heritage studies and regarded as a category for conservation. According to the UNESCO World Heritage Convention, "cultural landscapes" are landscapes distinguished by "combined works of nature and man" that illustrate the evolution of human society and settlement over time, under the influence of physical constraints and/or opportunities presented by the natural environment, as well as successive external and internal social, economic, and cultural forces (World Heritage Centre, 2016).

The European Landscape Convention defines a (cultural) landscape as any portion of territory whose personality results from the interaction of natural and/or human qualities as "perceived by people" (Council of Europe, 2000a, Chapter 1). In fact, cultural landscapes as a component of cultural heritage resources reveal the historical and ongoing interactions of a cultural group with nature and the environment (Aktürk & Dastgerdi, 2021; Schmitz & Herrero-Jáuregui, 2021).

The European Landscape Convention and the UNESCO Convention each preserve cultural landscapes in their own unique ways. The European Landscape Convention seeks to preserve nationally or regionally significant landscapes, and to that end, it encourages local community collaborations (Sargolini, 2013). The objective of the UNESCO Convention is to preserve only those landscapes that are internationally recognized as exceptional heritage sites. For millennia, cultural landscapes have undergone constant evolution. Due to the increasing number of uncertainties and susceptibility to natural hazards in these regions, planners and site managers are faced with new challenges.

In recent years, climate change has posed an ever-increasing threat to the social and cultural components of landscapes around the world (D. Harvey & Perry, 2015; UNESCO, 2007). Warming temperatures, ocean acidification, and increased weather volatility are just a few of the impacts that will alter the physical characteristics of cultural landscapes, including how people

live, work, and play in these areas (UNESCO, 2007). Climate change risks, land abandonment, and forecasting model imprecision all contribute to these uncertainties, necessitating effective strategies for reducing disaster risks. A risk management strategy is a systematic process that employs administrative directives, organizational structures, and operational competencies to implement strategies and mitigate the adverse effects of hazards and the probability of a catastrophe (United Nations International Strategy for Disaster & Reduction, 2009). Resilience has been advocated for being prepared for natural hazards as a component of risk management.

3.13. Disaster risk reduction in cultural landscapes

Cultural landscapes have received little attention in the primary disaster risk reduction guidelines. Despite growing recognition of resilience in academic publications, the concept and characteristics of organizational resilience have remained largely undefined and vague. This thesis has a relatively narrow conceptual objective and is the first step of ongoing research efforts to investigate and develop a comprehensive understanding of the complex relationships between resilience and planning in the context of cultural landscapes. It seeks to contribute to ongoing debates by focusing on public sector organizations (e.g., state authorities or local government and administration). In an effort to standardize terminology, Table 3.7 provides a summary of the terminology based on the definitions provided by the United Nations International Office for Disaster Risk Reduction (UNISDR).

Term	Definition
Risk	"The combination of the probability of an event and its negative consequences."
Disaster Risk	"The potential disaster losses, in lives, health status, livelihoods, assets, and services, which could occur to a particular community or a society over some specified future time period."
Hazard	"A dangerous phenomenon, substance, human activity or condition that may cause loss of life, injury or other health impacts, property damage, loss of livelihoods and services, social and economic disruption, or environmental damage."
Vulnerability	"The characteristics and circumstances of a community, system or asset that make it susceptible to the damaging effects of a hazard."
Resilience	"The ability of a system, community or society exposed to hazards to resist, absorb, accommodate to and recover from the effects of a hazard in a timely and efficient manner, including through the preservation and restoration of its essential basic structures and functions."
Exposure	"People, property, systems, or other elements present in hazard zones that are thereby subject to potential losses."

Table 3.7. Terminologies are derived from the UNISDR-provided definition. (United Nations International Strategy for Disaster & Reduction, 2009).

3.13.1. International guidelines for disaster risk reduction

Multiple types of natural disasters occur annually, resulting in human deaths, economic losses, infrastructure destruction, and population displacement. From 1991 to 2016, hydrometeorological (including hydrometeorological and climatological) and geophysical events claimed 1,6 million lives and had an impact on 5,6 billion people. Floods, storms, extreme temperatures, and other weather-related hazards caused the majority of events during this time period. Hydro-met incidents are the most prevalent, as evidenced by the amount of money lost and the number of people affected. The same number of individuals perished as a result of geophysical events (Fig. 3.6). To mitigate the effects of natural disasters, prompt and appropriate action must be taken immediately. Developing a long-term strategy is also essential for mitigating the negative effects of natural disasters (Zimmermann & Keiler, 2015).

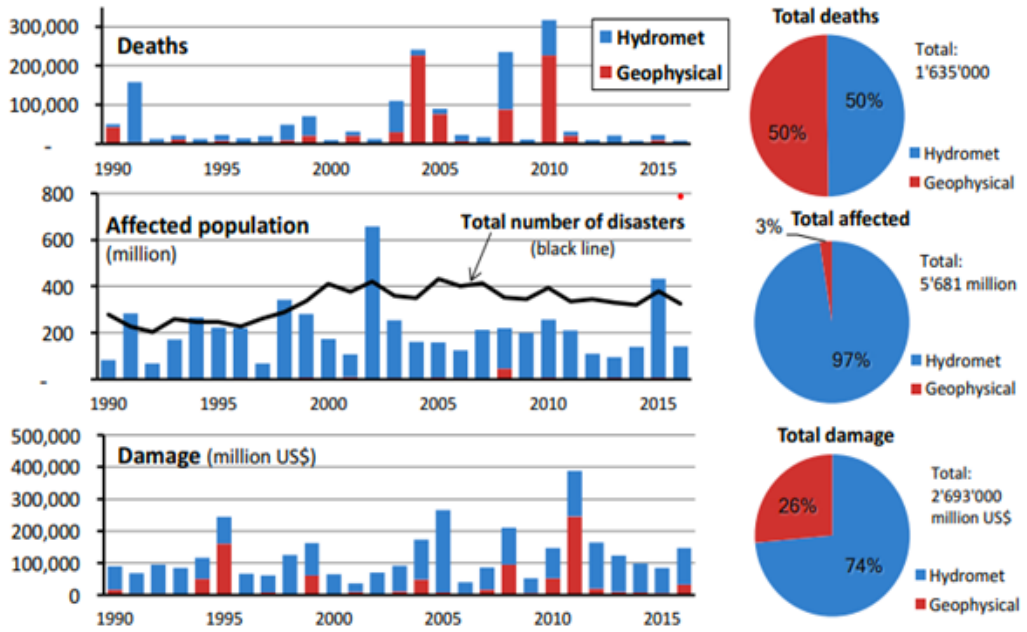

Figure 3.6. Deaths, impacted populations, and economic cost (destruction) from natural disasters from 1991 to 2016 (Guha-Sapir et al., 2015).

Establishing a connection between sustainable development and disaster risk reduction has been consistently emphasized in major global agreements throughout history, beginning with the "Millennium Development Goals" (United Nations Millennium Summit, 2000) to the

"Johannesburg Plan of Implementation" (World Summit on Sustainable Development, 2003) to the "Hyogo Framework for Action" (The United Nations Office for Disaster Risk Reduction (UNDRR), 2005). From "The Future We Want" (UN. General Assembly, 2012) to the "2030 Agenda for Sustainable Development" (United Nations, 2015), and finally to the "Sendai Framework for Disaster Risk Reduction" (United Nations Office for Disaster Risk Reduction, 2015).

As the first global framework for disaster risk reduction, 168 countries adopted the Hyogo Framework at the 2005 Second World Conference on Disaster Reduction. The Hyogo Framework for Action 2005–2015 comprises three strategic goals, a number of guiding principles, five priorities for action (PAs), and recommendations for implementing and monitoring those priorities. There are 10 to 15 actions related to each PA that governments and communities are expected to take, including (i) Ensuring that disaster risk reduction is a national and local priority, with an adequate governance basis to achieve it; (ii) Disaster risks should be continuously identified, assessed, and monitored, and early warning systems should be improved; and (iii) All levels of the organization may benefit from the knowledge, creativity, and innovation of those with experience in disaster risk reduction.

The primary shortcomings in implementing the Hyogo Framework are the underlying causes of risk, the need to establish shared responsibility for disaster resilience at all stages, and the necessity to implement strategies effectively. The gaps demonstrate the need for developing a framework for action that governments and other stakeholders can use to assist and complement one another. It aids in identifying disaster risks and directs investment to bolster resilience (United Nations Office for Disaster Risk Reduction, 2015, para. 9). Nearly ten years later, in March 2015, the Sendai Framework was adopted at the Third United Nations World Conference on Disaster Risk Reduction. The Sendai Declaration is a 15-year, voluntary, non-binding international agreement on disaster risk reduction with seven goals and four actions to prevent future natural disasters and mitigate existing disaster risks. The four recommended actions are as follows: (i) increasing awareness of disaster risk; (ii) improving disaster risk governance; (iii) investing in disaster risk reduction to make people more resilient; and (iv) "rebuilding more effectively." These are the suggested measures for making landscapes more resilient to natural disasters.

3.13.2 Risk management in the World Heritage Sites

Disasters result from the cumulative effects of threats and vulnerabilities generated by the complex interaction of multiple interlocking causes, the majority of which are entirely under human control. By bolstering the resiliency of the assets to be safeguarded, it is possible to prevent them or, at the very least, to reduce their impact substantially (Fig. 3.7). Moreover, the impact of a single disaster on cultural and environmental assets far outweighs the deterioration caused by long-term, cumulative decline and frequently results in their eradication. Therefore, disaster risks should be the most important consideration for heritage managers (World Heritage Centre, 2010).

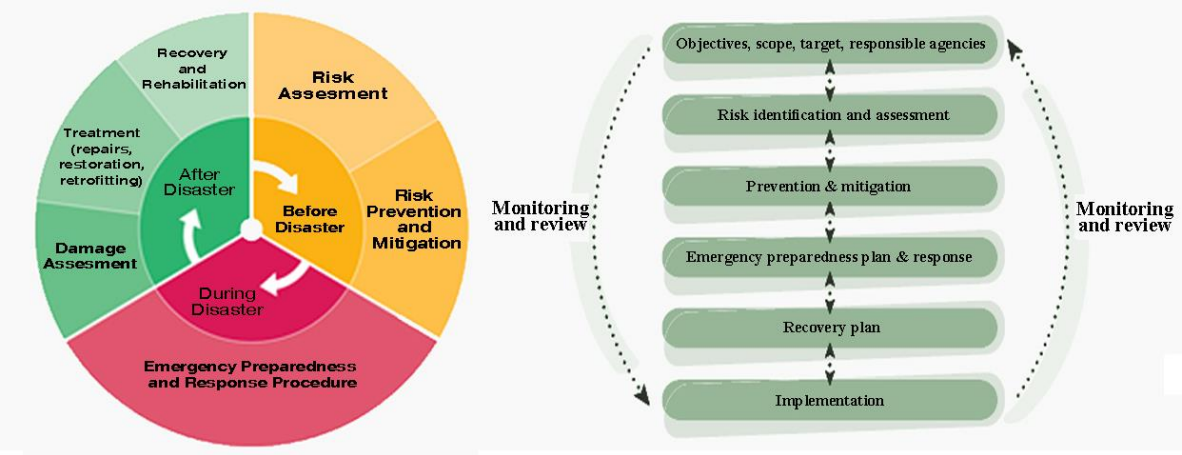

Figure 3.7. Schematic representation of the disaster risk management cycle

Despite the necessity of incorporating disaster risk reduction and resilience into cultural landscape management plans, these concepts are rarely discussed in international policy discussions. After the World Heritage Committee requested in 2004 that a risk-preparedness strategy be developed, and after some early activities in this area led by the International Council on Monuments and Sites (ICOMOS), the World Heritage Committee adopted in 2007 the "Strategy for risk reduction at World Heritage Properties" drafted by the World Heritage Centre in 2006. It had two primary goals: (i) to assist States Parties to the Convention in ensuring that world heritage assets in their countries were protected in the event of a disaster; and (ii) to assist the World Heritage Committee, the World Heritage Center, and the Advisory Boards in ensuring that the World Heritage Fund was used strategically to reduce disaster risk.

In order to achieve the stated objectives of the strategy, the following objectives and activities are suggested: (i) increase global, regional, national, and local institutional support for minimizing threats at World Heritage Sites; (ii) improve risk preparedness at World Heritage Sites through

knowledge, innovation, and education; (iii) examine, analyze, and monitor natural hazards at World Heritage Sites; and (iv) reduce potential risk at World Heritage Sites (UNESCO World Heritage Centre, n.d.). In order to increase the cultural landscape's resilience to natural hazards, it is necessary to establish a supportive legal, policy, institutional, and operational framework, as well as to define roles and coordinate policies and procedures for diverse stakeholders across the spectrum of disaster risk management practices, from risk assessment to preparedness, response, and recovery.

3.13.3. Discourses of Resilience

Resilience is a polysemic concept that has been used in a variety of disciplines (Norris et al., 2008). The concept of resilience, as opposed to resistance, represents a novel approach to disaster risk reduction. The term "resilience" is interpreted differently by groups with varying research and policy objectives. They use it to formulate and conceptualize their own agendas (Table 3.8). While some academics use resilience for climate change adaptation and mitigation, others employ it for human development, disaster risk reduction, and global development. In recent years, in environmental management and urban planning, the concepts of urban and landscape resilience have garnered considerable attention and interest (Lu & Stead, 2013).

The literature distinguishes three fundamental definitions of urban and landscape resilience. This includes engineering resilience, ecological resilience, and adaptive resilience. First, engineering resilience theories prioritize reducing catastrophe susceptibility by enhancing the resistance and robustness of the physical infrastructure. Based on this definition of resilience, disruptions, and catastrophes can be significantly anticipated and avoided. In other words, cities and their infrastructures must be resilient. According to some researchers, the reliance on engineering approaches for constructing urban resilience may provide planners and decision-makers with a false sense of security (Ahern, 2011). Second, planning scholars have borrowed the concept of resilience primarily from the ecological domain.

Ecological resilience requires a more dynamic and adaptable strategy that recognizes the inadequacy of resistance and robustness in the development of urban resilience. It promotes the incorporation of safety margins into the design of the system in order to absorb early shocks, maintain operation, and limit total losses. An environmentally robust system may reach new

equilibrium states during the healing phase. However, the structure and function of the system's core remain intact (Sharifi & Yamagata, 2016).

Thirdly, the concept of "adaptive resilience" recognizes system complexity and dynamics, and it facilitates characterizing and understanding urban resilience as a complex and dynamic social-ecological system. Here, urban and landscape resilience is defined as the capacity of urban systems to continuously develop short-term coping and long-term adaptation strategies in response to constantly changing system dynamics and complexities at a variety of spatial and temporal scales. This definition is grounded in adaptive resilience. In order to make cities and landscapes more resilient, it is necessary to incorporate essential principles and traits into the urban system. These characteristics include, among others, robustness, stability, diversity, redundancy, flexibility, resourcefulness, coordination capacity, modularity, collaboration, agility, efficiency, creativity, equity, foresight capacity, self-organization, and adaptability.

Resilience as	Definition of the concept	Source
Absorption	To absorb adverse impacts	UNISDR (2009) (UNISDR & others, 2009).
Adaptive	The capacity of systems, institutions, humans, and other species to adapt to possible harm, seize opportunities, or deal with repercussions	Pelling (2011) (Pelling & Manuel-Navarrete, 2011).
Resistance	The capability of calculating the physical damage to the network caused by the hazard	Serre et al. (2018) (Serre & Heinzlef, 2018).
Reaction	A system's potential to restructure and recover from change and disruption	Ahern (2011) (Ahern, 2011).
To rebuild	The process of reorganizing while the enduring change in order to maintain substantially the same function, structure, identity, and feedback	Walker et al. (2004) (Walker et al., 2004).
Learning	The extent to which the system may develop and expand its ability to learn and adapt.	Walker and Salt (2012) (Walker & Salt, 2012, p. 128).

Table 3.8. characteristics of the concept of resilience

In order to promote the resilience of cultural landscapes, it is essential to incorporate resilience thinking into urban planning and design. Numerous policy documents, such as the Hyogo Framework for Action 2005–2015 and the Sendai Framework for Disaster Risk Reduction 2015–2030, emphasize the necessity of implementing this integration. Traditional disaster risk management in cultural landscapes focuses primarily on vulnerability assessment and the development of action plans to reduce vulnerability. Vulnerability is a state-based term that is

frequently evaluated prior to the occurrence of an event. However, resilience-oriented disaster management emphasizes the importance of understanding the dynamics and complexity of the cultural landscape and seeks to explain how these dynamics and feedback change over time and space. Developing a framework for resilience-based planning in the cultural landscape requires ongoing and methodical efforts to coordinate the four main phases of the adaptive cycle: exploitation, conservation, release, and reorganization. The medium- and long-term nature of climate change-related events may conflict with the short-term nature of election cycles that influence cultural landscape policy. This temporal mismatch requires developing effective solutions, such as increasing citizen awareness. Thus, resilience-based planning in the cultural landscape can be viewed as a dynamic quality that demonstrates vulnerability changes over time.

3.13.4. Governance and Barriers

Governance refers to the management of a society's economic, political, and social affairs. It includes values, policies, institutions, and implementation strategies. It also involves interactions among the government, civil society, and private sector. Governments play multiple roles in disaster risk reduction, including: (i) as providers of disaster risk reduction goods and services; (ii) as supervisors of private sector activities; (iii) as proponents of collective action and private-sector involvement; and (iv) as coordinators of multi-stakeholder initiatives and partnerships for disaster risk reduction. Effective governance should include making disaster risk reduction a policy priority, allocating sufficient funds and resources to it, ensuring that it is carried out correctly, and making it easy for all relevant stakeholders to participate with regard to resilient planning. Disasters should be viewed as a government responsibility, and disaster risk reduction should be a matter of public policy. Integrating disaster risk reduction and community resilience initiatives into disaster management presents cultural, political, and institutional obstacles. These obstacles are (a) a lack of awareness of community resilience and the social dimensions of risk; and (b) a lack of suitable methods and approaches to enhance disaster risk reduction and promote societal resilience. According to the research findings, the current vision for the management of cultural landscapes is still very close to the traditional paradigm that accords heritage materials an intrinsic value, requiring significant collection, cataloging, and preservation efforts in anticipation of the probable philological restoration of the damaged heritage resources.

Due to the political nature of a command-and-control approach to social-ecological governance, it must be reconsidered. At every level of social-ecological governance, political obstacles must be

surmounted. It necessitates the formation of goal-oriented governance and an inclusive goal-setting procedure. A diverse set of stakeholders must be involved in the planning, creation, and execution of strategies. Instead of centralizing all knowledge, technology, resources, and responsibilities, a socially sustainable system of government should permit a diverse group of individuals from around the world to share these resources (Imperiale & Vanclay, 2021). The strategies that guide the planning, design, and implementation of disaster risk strategies in cultural landscapes should be equitable, inclusive, and mindful of community well-being, sustainability concerns, and the residents' needs.

3.13.5. Cultural landscape resilient planning and participation of the local community

In cultural landscapes, the participation of the local community is essential for resilient planning. They contribute a plethora of resources, especially conservation knowledge, and abilities, that can be used to reduce risk. Working directly with locals enables regional planners and site managers to comprehend landscape issues, enabling them to operate more effectively and efficiently. In practice, the term "participation" can refer to a variety of concepts, such as self-help, volunteerism, civic discourse, public consultation, political/administrative decentralization, transfer of responsibility, formal partnerships between individuals or organizations, and community planning. In addition, transparency, dialogue, and collaboration between organizations and the local community help to increase participation, thereby enabling initiatives to flourish. Different communities and external agents, the scope and nature of the problems to be solved, and the project activity planned or carried out all influence the nature of participation. Participation techniques and the degree to which the community is in charge are available in a vast array of shapes and sizes. Nevertheless, participation in resilient planning can be categorized into two broad categories: directed and people-centered. Directed participation seeks to involve individuals in initiatives, primarily during the implementation phase and on occasion during the planning phase. Even with public input, projects are still initiated and ultimately managed by external agencies and professionals; in other instances, community engagement may be limited to specific responsibilities outlined by the agency or professional sponsoring the project.

People-centered involvement, on the other hand, aims to empower communities by involving them in the identification of issues and needs, the decision-making process, the implementation of agreed-upon activities, the evaluation of results, and the distribution of benefits. However, things are frequently less clear-cut: specific initiatives may include directed and people-centered

participation elements, for instance. Indeed, the goal is to involve as many local communities as possible in the cultural landscape's debate, decision-making, implementation, monitoring, and evaluation processes. Community participation in disaster risk management may be difficult to manage. Too much administration may negate the intended outcome, and skillful facilitation requires empathy. Professionals and community members may need to modify their perspectives to gain mutual respect and understanding. Organizations should strive to cultivate a cadre of participatory employees who are well-versed in participatory concepts, methods, and strategies. Programs for disaster risk management should aim to strengthen the organizational capacity of the community. Organizations are better equipped to analyze problems, create solutions, exchange ideas and strategies, take the initiative, assist and motivate members, negotiate with other parties, and advocate for change. By understanding how local communities perceive and respond to risks in cultural landscapes, local authorities can design supplementary interventions. Professionals in development, relief, and recovery must recognize and actively support the value of indigenous skills and practices. This method fosters greater community collaboration in risk management. Identifying individuals with local knowledge of the landscape should be one of the first steps for organizations seeking to promote people-centered participation.

Regional planners must also keep in mind that resilient planning and its implementation in cultural landscapes is a long-term and ongoing endeavor. In order to fully integrate resilience planning into the cultural landscape management plan, a participatory approach is required. The ultimate objective is to develop a hybrid knowledge base that incorporates the perspectives of the local community, site administrators, and researchers. Collaboration, on the other hand, enables individuals to develop a shared vision and find ways to bring common interests to the fore beyond the limitations of a single project.

3.14. Developing a conceptual framework for resilient planning in cultural landscapes

Observations indicate that the climate is changing rapidly, approximately ten times faster than natural climate changes, based on pale climatic observations of the changes that have occurred since the end of the last ice age. Moreover, the evidence suggests that the climate changes of the last half-century are largely attributable to human activities, particularly the burning of fossil fuels and also land-use change, most notably deforestation. Unsurprisingly, many national and international leaders have concluded that climate change, often referred to in the media as global

warming, has become one of humanity's most pressing problems (The Global Commission on Adaptation, 2019). Globally, climate change alters the frequency and magnitude of natural disasters and creates new vulnerabilities (Gardoni et al., 2016). These threats consist of heatwaves and their effects on droughts and wildfires, intense precipitation and its effects on floods and significant snow events, and hurricanes. It has become increasingly evident that our future depends on our efforts to mitigate climate change (United Nations Climate Change, 2019). In this regard, science serves as the foundation for enhancing responses to climate change by providing:

- Intent on developing a cost-effective plan to mitigate these effects; impetus to act now rather than later.
- The knowledge that such a plan must include both adaptation and mitigation.
- Knowledge of the sources of the polluting emissions and the nature of a society's vulnerabilities enables the design of a plan with the required level of specificity.

Thus, we have essentially three options:

- Mitigation refers to actions taken to reduce the rate and magnitude of climate change caused by human activities.
- Adaptation, which refers to measures taken to mitigate the negative effects of climate change on human well-being.
- Negative effects and societal disruption cannot be avoided through mitigation or adaptation.

The generic structure of the Hyogo and Sendai frameworks enable their application in a variety of geographical settings, including cities, coastal areas, and cultural landscapes. However, little is said about their implementation in these contexts, and they should be adapted to local conditions. Due to the unique characteristics of resilient planning in cultural landscapes (risk assessment, risk management, and disaster management), this context requires clear guidance on a number of crucial issues. Both framework texts address these issues, with little difference in their relative importance. Overall, the two volumes guide the most significant issues related to disaster risk reduction in environmental settings. Accurate knowledge of the hazards, vulnerabilities, and risks is one of the most important aspects of planning for resilience in a cultural landscape. In recent years, a number of international agencies and nongovernmental organizations have developed

guidelines and tools for assessing and managing landscape hazards. Several articles emphasize the need to cultivate risk consciousness through participatory methodologies and to create community-based hazard and risk maps for emergency management. Planning based on resilience can be viewed not only as a specific topic, but also as a broad development theme that encompasses a variety of issues, such as cultural landscapes. While both frameworks emphasize that disaster risk reduction is not the sole responsibility of a single organization (such as emergency management), they also stress that it must be incorporated into development initiatives in order to prevent the emergence of new threats. Although cultural landscape resilience is not explicitly addressed in the Hyogo and Sendai frameworks, it may benefit from a new planning approach, particularly under Priority Area 2 — enhancing disaster risk governance to manage disaster risk — and Priority Area 3 — enhancing disaster risk governance to manage disaster risk. Priority 3 of the Sendai Framework focuses on ensuring that ecosystems are managed sustainably and that disaster risk reduction is integrated into environmental and resource management. Because the cultural landscape is defined as a "perceived by people" portion of the territory. In this context, these objectives and activities are especially important and require a community-level perspective. PA3 and PA5 of the Hyogo Framework demonstrate how to use knowledge, innovation, and education to establish a culture of safety and resilience at all levels.

Resilience has been a central and enduring factor in social-ecological systems research (Folke et al., 2010), commonly defined as a system's capacity to recover or reorganize its function following a shock or catastrophe (Holling, 2001). Considering resilience from a social-ecological perspective enables cultural heritage managers to consider climate change impacts beyond the current threshold of landscapes through dynamic identification and management of heritage values. Seekamp and Jo (2020) advocate incorporating ecological-resilience theory into cultural heritage policies; this enables the transformative continuity of cultural landscapes while enhancing their adaptability (Seekamp & Jo, 2020). A central insight from the literature on social-ecological systems is that the resilience of cultural landscapes can be increased through adaptive, participatory governance that leverages local and traditional knowledge to manage complexity (Walker et al., 2002).

Resilience in urban areas is now a planning requirement for preparing and adapting urban populations and landscapes to the significant rise in natural hazards (Heinzlef & Serre, 2022). In actuality, this concept has been utilized more frequently in political debates and the media than in

actual actions. International organizations and governments are promoting urban resilience as a viable policy strategy to aid communities in coping with current and future urban risks. Resilience is constantly being redefined and clarified as a theoretical and policy concept. To be effective, public managers and bureaucrats must embrace resilience and translate it into forms that make intellectual and operational sense (Normandin et al., 2019).

Chapter Four
Findings

4.1. Toward a framework for boosting cultural and natural heritage conservation- the case of central Italy

4.1.1. Study Area

Because of the presence of high mountain ranges such as the Alps and the Apennines, as well as its proximity to the Mediterranean Sea, Italy has an extremely complicated climatic formation. In terms of atmospheric circulation, the Mediterranean and Italy are influenced by tropical air masses in the summer and western air masses in the winter. Because of the unpredictability of these circulation patterns and their interactions with such a complex system, the Mediterranean area is especially vulnerable to climate change and sensitive to both global and local occurrences (Ministry for the Environment, 2009). This section focuses on central Italy, one of the country's five macro-regions with a total size of 58,085 km2. Tuscany, Lazio, Umbria, and Marche are the four regions that make up Central Italy (Ministry of the Environment and Land Protection, 2006). Italy leads the UNESCO World Heritage List with 55 World Heritage Sites. Central Italy is home to 13 UNESCO World Heritage Sites (Fig. 4.1) (World Heritage Centre, 2019b).

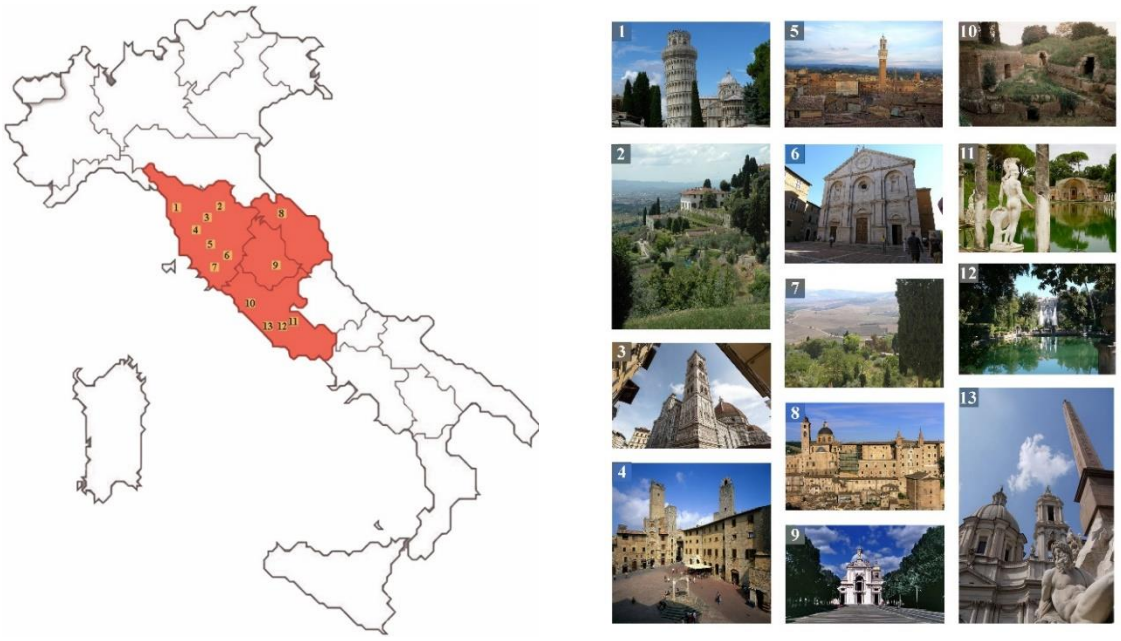

Figure 4.1 World heritage sites in Central Italy (World Heritage Centre, 2020).

Table 4.1 shows that many of these sites are valuable medieval and Renaissance treasures that meet different criteria of Outstanding Universal Value (Table 4.2).

Region	World Heritage Site	Year	Category of inscription
Tuscany	Piazza del Duomo, Pisa	1987	(i)(ii)(iv)(vi)
	Medici Villas and Gardens	2013	(ii)(iv)(vi)
	Historic Centre of Florence	1982	(i)(ii)(iii)(iv)(vi)
	Historic Centre of San Gimignano	1990	(i)(iii)(iv)
	Historic Centre of Siena	1995	(i)(ii)(iv)
	Historic Centre of Pienza	1996	(i)(ii)(iv)
	Val d'Orcia	2004	(iv)(vi)
Marche	Historic Centre of Urbino	1998	(ii), (iv)
Umbria		2000	(i), (ii), (iii), (iv), (vi)

	Assisi, the Basilica of San Francesco and Other Franciscan Sites		
Lazio			
	Etruscan Necropolises of Cerveteri and Tarquinia	2004	(i)(iii)(iv)
	Villa d'Este	2001	(i)(ii)(iii)(iv)(vi)
	Villa Adriana	1999	(i)(ii)(iii)
	Historic Centre of Rome	1980	(i)(ii)(iii)(iv)(vi)

Table 4.1 World heritage sites in Central Italy (World Heritage Centre, 2019a)

Type	Criteria	Definition
Cultural	(i)	to represent a masterpiece of human creative genius
	(ii)	to exhibit an important interchange of human values, over a span of time or within a cultural area of the world, on developments in architecture or technology, monumental arts, town-planning or landscape design
	(iii)	to bear a unique or at least exceptional testimony to a cultural tradition or to a civilization which is living or which has disappeared
	(iv)	to be an outstanding example of a type of building, architectural or technological ensemble or landscape which illustrates (a) significant stage(s) in human history
	(v)	to be an outstanding example of a traditional human settlement, land-use, or sea-use which is representative of a culture (or cultures), or human interaction with the environment especially when it has become vulnerable under the impact of irreversible change
Natural	(vi)	To be directly or tangibly associated with events or living traditions, with ideas, or with beliefs, with artistic and literary works of outstanding universal significance.
	(vii)	to contain superlative natural phenomena or areas of exceptional natural beauty and aesthetic importance
	(viii)	to be outstanding examples representing major stages of earth's history, including the record of life, significant on-going geological processes in the development of landforms, or significant geomorphic or physiographic features
	(ix)	to be outstanding examples representing significant on-going ecological and biological processes in the evolution and development of terrestrial, fresh water, coastal and marine ecosystems and communities of plants and animals

(x)	to contain the most important and significant natural habitats for in-situ conservation of biological diversity, including those containing threatened species of outstanding universal value from the point of view of science or conservation

Table 4.2 The Criteria for Outstanding Universal Value Based on the Operational Guidelines for the Implementation of the World Heritage Convention (UNESCO World Heritage Center, 2019).

4.1.2. Landscape as a cultural heritage

There is a strong link between cultural heritage sites and natural heritage sites in many "cultural landscapes" in Italy. This is especially true in central Italy, where many small historic towns and their natural heritage and natural resources work well together. Tables 1 and 2 show, for example, that the landscape of Val d'Orcia in Tuscany's province of Siena is a great example of a harmonious combination. The Italian Ministry of Cultural Heritage and Activities has a "landscape vision," which is a mix of cultural goods and landscape resources (Ministero per i Beni e le Attività Culturali, 2004). This is meant to show what cultural heritage means. As climate change changes the landscape, the cultural and natural heritage conservation framework should be able to assess the importance and vulnerability of heritage resources at the beginning of communication and policymaking. Even though both the UNESCO Convention of 1972 and the Europe Landscape Convention have the same goal of preserving heritage, their approaches are different. This means that cultural and natural landscapes are defined differently, and so are heritage policies.

In the UNESCO 1972 Convention, the idea of heritage is separated into two distinct and independent notions: cultural heritage and natural heritage. Cultural heritage is described under Articles 1 and 2 of the UNESCO convention as monuments and groups of structures and places of historical, artistic, archaeological, scientific, ethnological, or anthropological significance. Exceptional physical, biological, and geological formations, habitats of endangered animal and plant species, and locations of scientific or aesthetic significance constitute natural heritage (UNESCO, 1972).

In 1992, the cultural requirements were somewhat updated to "cultural landscape" in the Operational Guidelines for the Implementation of the World Heritage Convention, despite the concept's origins dating back to Carl O. Sauer in 1925 (Sauer, 1925). As depicted in Table 4.3, UNESCO has divided cultural landscapes into three categories (World Heritage Centre, 1999, paras. 35–42). According to UNESCO, historical characteristics are essential for the preservation

and inscription of a cultural landscape on the world heritage list. For instance, UNESCO considers the presence of traditional crops and local products, as well as the presence of buildings associated with agricultural activities, to be major components of cultural landscape integrity.

However, establishing how to effectively assess the threshold of conventional traits or historical durability in an environment that is changing presents challenges. In addition, social and economic considerations have a substantial impact on the preservation of the site's authenticity.

Cat.	Type	Definition
(i)	Clearly defined	Designed and created intentionally by man. This embraces garden and parkland landscapes characteristically constructed for aesthetic, social, and recreational reasons which are often associated with religious or other monumental buildings and ensembles
(ii)	Organically evolved	Fall into two sub-categories. First, a relict landscape is one in which an evolutionary process came to an end at some time in the past. Second, is one which retains an active social role in contemporary society closely associated with a traditional way of life.
(iii)	Associative cultural	Landscapes with definable powerful, religious, artistic, or cultural associations with the natural element rather than material cultural evidence.

Table 4.3 UNESCO categories for the cultural landscape

The European Landscape Convention, adopted in Florence in 2000, is the first international agreement dedicated completely to the cultural landscape. It defines cultural landscape as any portion of the region "as experienced by humans, whose character is the outcome of the interaction of natural and human elements" (Council of Europe, 2000b). The convention underlines that landscape is the result of a community's engagement with its environment through time. The European Landscape Convention's perspective differs from that of the UNESCO Convention in that its approach to cultural landscape is a quality of each area, and not just of those with outstanding landscape values. While the European Landscape Agreement is more locally focused and takes into account a holistic and social landscape, the UNESCO convention attempts to safeguard only those landscapes whose outstanding value has been acknowledged internationally (Trusiani, 2013). Before designing isolated climate adaptation plans, it is beneficial to determine what distinguishes buildings, landscapes, and other community elements into a distinct culture. Additionally, the cultural environment is not extraordinarily beautiful or remarkable, but rather

distinct and singular. Therefore, it is vital to sensitize and adequately educate both governments and people on the landscape's worth and to engage them in heritage planning. This strategy collects agricultural and forestry assets, architectural assets, and cultural traditions into a distinct or defining package. The cultural landscape approach encompasses both natural and cultural assets, within which we must examine not just agricultural or forest heritage, but also architectural features and archaeological sites (Amoruso & Salerno, 2019). Adopting the framework of the European Landscape Convention is, therefore, more appropriate for creating a more grounded understanding of cultural heritage in central Italy and so enhancing climate adaption capability in this region (Sargolini, 2016).

4.1.3. Climate change impacts in Central Italy

In addition to disrupting the socioeconomic dynamics of cultural landscapes, climate change, and its associated environmental dangers can also have a negative impact on the socioeconomic dynamics of natural environments. According to the Italian National Institute of Statistics (ISTAT, 2018), the country's average annual temperature between 2002 and 2016 was 15,5 degrees Celsius, a 1 degree Celsius rise from 1971 to 2000. During 2002-2016, there were an average of 110 summer days and 45 tropical nights; this is 17 and 14 days and nights greater than the climatological norm for Italy. Observations of the climate confirm a rise in the average monthly temperature and an increased trend in extreme temperatures (Fig. 4.2). In Tuscany, for example, the rise in maximum temperature (+0.44 °C/decade) was somewhat larger than the increase in lowest temperature (+0.38 °C/decade), resulting in an increase in the summer daily temperature range (+0.06 °C/decade) (Bartolini et al., 2008).

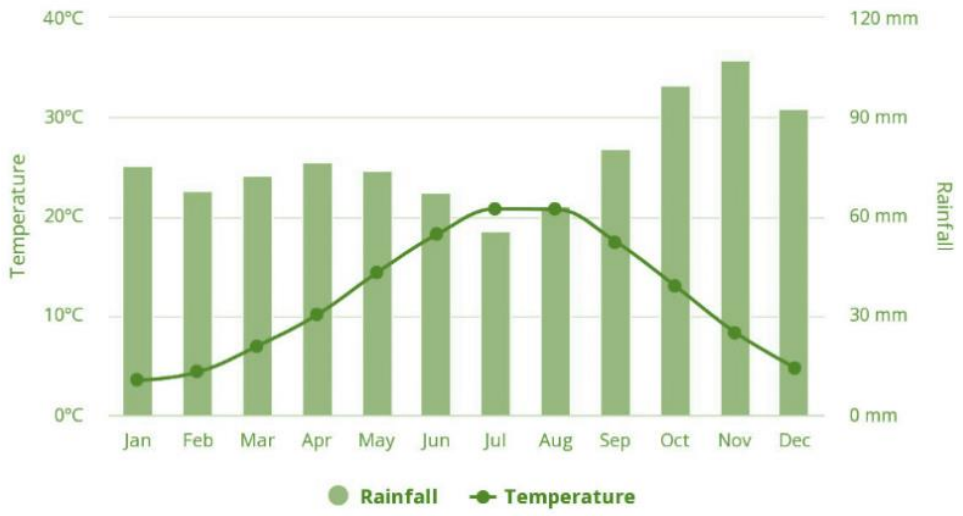

Figure 4.2 Average monthly temperature & precipitation of Italy for 1901-2016 (World Bank, 2019)

In central Italy, floods and landslides are among the most significant threats that might cause permanent harm to cultural landscapes (Fig. 4.3). In this sense, the intangible aspects of the cultural landscape may be threatened by population loss resulting from infrastructural degradation, the development of pollution and water-related illnesses, soil erosion, and harm to agricultural areas and crops. For example, between 1939 and 2004, Italy was struck by 28 severe floods that harmed 2.85 million people and displaced 1.5 million. The number of casualties over this time period was 694, and the estimated cost of these climate consequences was 32.7 million U.S. dollars. After the May 1998 floods in Campania, climate concerns increased by natural catastrophes in the region, such as the 2016 earthquake in central Italy that destroyed cultural heritage treasures and killed over 300 people. Under statute 267/98, Italy produced a national plan titled "Urgent measures for the reduction of hydrogeological risk and for regions impacted by landslides in the Campania region" to reduce the risks of flooding and landslides (Normativa nazionale, 1998). However, this regulation does not account for the greater hazards posed by climate change scenarios, for which there is presently no evaluation (Sgobbi & Carraro, 2008).

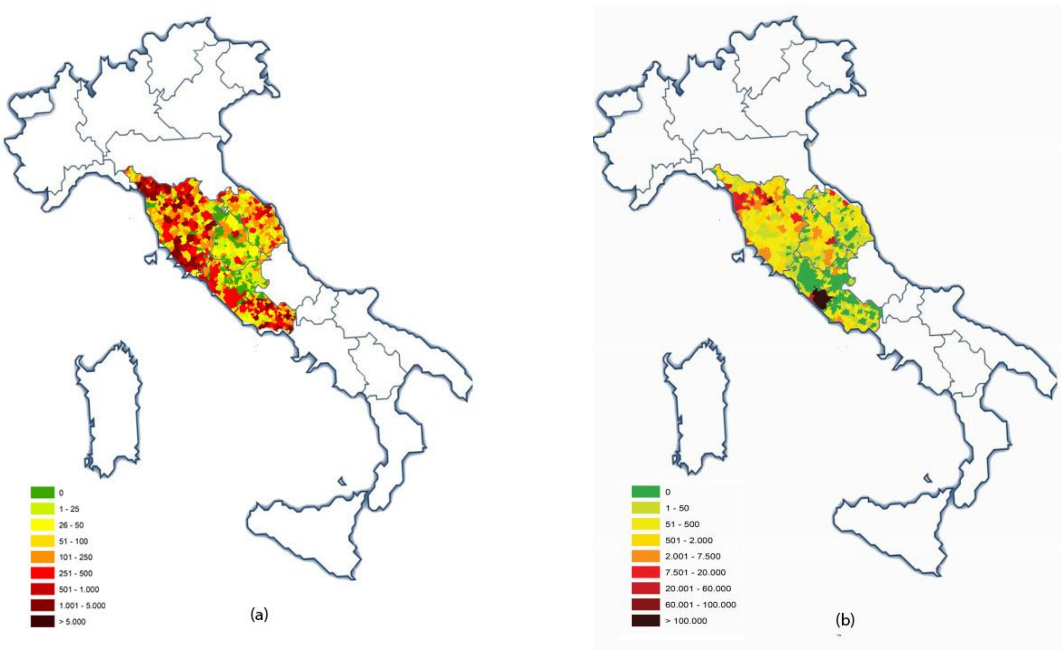

Figure 4.3 (a) The population at risk of landslides in central Italy; (b) The population at risk of floods in central Italy, derived from (ISTAT, 2015)

Climate change threats and extreme weather patterns may cause irrevocable damage to the values of many cultural items in central Italy. These dangers have an impact not just on the landscape's identity, but also on the tourism sector. Tourism and the economy may be disrupted or redirected, at least until living conditions in flood-affected regions are restored.

The loss of biodiversity and natural ecosystems as a result of climate change is a further cause for concern. Natural resources are important to the identity of the Italian territory. Moreover, in central Italy, cultural landscapes incorporate a large number of Natura 2000 areas, which contain the most precious and imperiled species and ecosystems in Europe. In the area of Umbria, Natura 2000 sites occupy around 15% of the total land. The locations include 41 habitats of European importance, 11 of which are rare species, 143 animal species (four of which are major), and eight plant species (Perna et al., 2018).

4.2. Climate change and cultural landscape conservation: insights from Cinque Terre

The case studies included in this part of the dissertation were selected using a number of criteria. First, there was the presumption that the fact that Italy and Canada are both industrialized Western economies with robust democratic governance systems makes it possible for an easier comparison

of research findings. This assumption was based on the fact that both countries have governance systems that are very similar. In addition, unlike Italy and Canada, the United States lacks a national land-use planning framework of its own. Second, different regions of the world are impacted by the effects of climate change in a variety of unique ways: It is anticipated that the mean temperature will rise in the majority of sites. In addition, some areas will have an increase in precipitation, whilst others will face an increase in the frequency of droughts. Therefore, rather than specifying particular climate change impacts as selection criteria, my objective was to get a deeper understanding of methods that facilitate participatory planning for the purpose of mitigating risk in cultural landscapes in response to a wide range of climate change effects. As a result, adding case studies from the United States would have added complexity to any comparison and was thus avoided. Finally, a criterion for case study selection was the requirement for long-term research interest in the issue. The cultural landscapes of Cinque Terre (Italy) and the Region of Waterloo (Canada) were chosen as study case studies based on these characteristics. The current study is also one of the first to evaluate the effects of climate change on a cultural landscape under the jurisdiction of UNESCO (the Cinque Terre) with a regionally administered landscape (Region of Waterloo).

4.2.1. Description of the study area

Cinque Terre, which translates as "five lands," is a region in eastern Liguria's province of La Spezia that includes the five Italian historical villages of Vernazza, Monterosso, Corniglia, Riomaggiore, and Manarola (Fig. 4.4). It depicts a traditional community's ongoing connection with natural resources in the form of agricultural terraces.

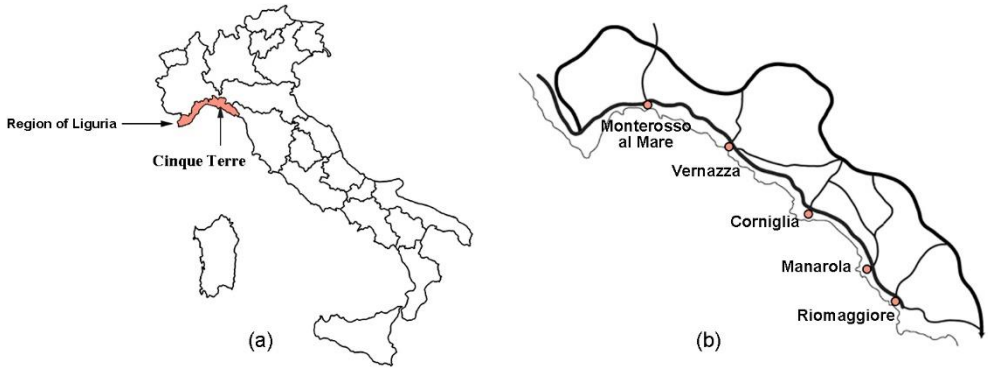

Fig. 4.4 (a) Cinque Terre is located in the Province of Spezia, Region of Liguria, and (b) it includes the five villages of Monterosso al Mare, Vernazza, Corniglia, Manarola, and Riomaggiore.

The area's topography is described as a hilly environment with deep valleys. It has a total size of 38.60 km2 and comprises very steep hills as well as minor watersheds that produce transitory streams (Fig. 4.5). Terraces constructed during the Middle Ages cover over 60% of the country. Dry stone ("Muro a Secco") has been commonly utilized to build and restore agricultural terraces. Cinque Terre was nominated to the UNESCO World Heritage list in 1997, followed by its designation as a national park in 1999, based on its historical and environmental value. Vernazza is the densest municipality in Cinque Terre, with a population density of 63.4 inhabitants/km2 (Urbistat, 2019b). Riomaggiore has the lowest population density, with 138.9 people per square kilometer (Urbistat, 2019a). Demographic data suggest a decline in the Cinque Terre population between 2014 and 2019. In Riomaggiore, for example, the population fell from 1483 to 1402 while focused on the settlements (Urbistat, 2019b). Vernazza between 803 and 779 (Urbistat, 2019a), and Monterosso al Mare between 1402 and 1415 (Urbistat, 2019b).

Cinque Terre is hard to get to by car because it is in the mountains. For example, the narrow roads to Vernazza end about a kilometer before the village. Regional trains have made it easier for people to get to Cinque Terre in recent years. But the railway infrastructure has also caused people to leave the mountainous areas, which has hurt the local knowledge and industries. Regional trains go through all five of the Cinque Terre villages and connect them to the country's major cities and regions. Since the 1970s, more tourists have been going to Cinque Terre because these regional trains make it easier to get there. The way people live and work in the area has changed because of this process.

Cinque Terre's original economy was based on fishing and agricultural products in the past. Given Cinque Terre's Mediterranean setting, fish has long been one of the area's primary dietary sources. Furthermore, the local people constructed agricultural areas by converting the Liguria region's alpine scenery into inclined terraces. Vineyards and olive groves were grown on these terraces. At the moment, the tourist sector is a major driver of socioeconomic activity in the landscape. Furthermore, as a result of widespread tourism and strong demand for services, living and labor expenditures in the cultural environment have skyrocketed. As a result, the direction of socioeconomic activity has steadily switched from a production to a consumption economy, distinguishing it from the area's historic economy. Because agricultural terraces require continual maintenance, abandoning traditional methods in favor of new livelihoods based on other industries

such as tourism might lead to slope instability and increase Cinque Terre's vulnerability to climate change hazards like as floods and landslides (Giordan et al., 2020).

Fig. 4.5 Left: Manarola scenic viewpoint; Right: Vernazza scenic viewpoint (Google Maps, n.d.).

4.2.2. Climatic conditions of Cinque Terre

The climate of Italy is Mediterranean, with dry summers and mild winters. The average yearly temperature in Cinque Terre is 13.6 °C. August is the hottest month of the year, with a mean temperature of 22.2°C, while February has the lowest mean temperature of 3.5°C. The yearly rainfall is 1387 mm (1999–2019), with most of it falling in November (Fig. 4.6).

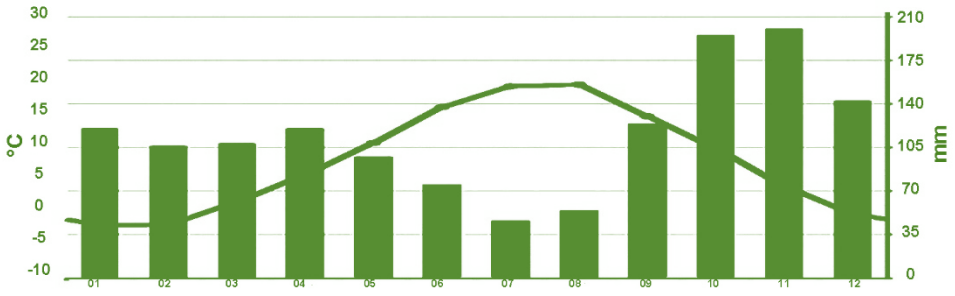

Fig. 4.6 Average monthly temperature and rainfall of Cinque Terre from 1999 to 2019 (Climate Data, 2021a).

According to the Italian National Institute of Statistics, the country's mean annual temperature increased by 1.0 °C between 2002 and 2016, compared to 1971–2000. (ISTAT, 2018). Between 1991 and 2003, the 13 major landslides killed 2,584 people. According to the EM-DAT database, the country's worst landslides cost more than $1 billion (Carraro & Sgobbi, 2008).

Climate data in Cinque Terre reveal a progressive increase in average temperature and rainfall, mirroring national patterns. Climate change has raised the risk of flooding and landslides within

the cultural landscape since agricultural terrace management necessitates traditional knowledge among the local community, particularly in order to maintain hydrological stability and manage water resources (Giordan et al., 2020). Through land abandonment, land-use change, and soil erosion, these hazards endanger the area's socio-ecological aspects.

4.2.3. Governance and management system

The Cinque Terre National Park acts as the local governing authority for the impacted villages. The Italian Law 394/91 on protected areas (or Park Law) defines national parks as follows:

"Terrestrial, fluvial, lake, or marine areas containing one or more intact ecosystems or those partially altered by human intervention, one or more physical, geological, geomorphological, or biological formations of international or national significance due to their naturalistic, scientific, aesthetic, cultural, educational, or recreational values, and which require state intervention to conserve for present and future generations" (art. 2).

Along with nature and science, the Italian idea of National Parks highlights the cultural significance of the man-made aspects of the protected areas. In other words, agricultural practices (such as dry-stoned walls, hedges, and irrigation systems) are preserved in tandem with indigenous species and other biological elements of the parks. The National Park Body is defined by the law as a "public entity with legal and administrative headquarters inside the park's limits that is subject to the Minister of the Environment's supervision" (Park Law, art. 9). As a result, it appoints the National Park Entity as the protected land's in situ management authority. It is important to note that the National Law prioritizes the protection and promotion of traditional agricultural activities within National Park boundaries, stating that the Entity is responsible for implementing management methods aimed at integrating people and the natural environment by safeguarding anthropological, archaeological, historic, and architectural values, as well as agro-silvopastoral and traditional activities (art. 1.3.b). Thus, the Cinque Terre National Park is a public institution with statutorily defined jurisdiction to protect the park's territory, and agricultural landscape conservation comes within the ambit of that authority (Salpina, 2021).

4.3. Climate change and cultural landscape conservation: insights from the region of Waterloo

4.3.1. Description of the study area

Waterloo Region is an upper-tier municipality in southwestern Ontario, Canada. It is made up of seven lower-tier municipalities, three of which are urban (480 persons per km2 across an area of 313.7 km2) and four of which are rural (an area of 1,055.3 km2) (Fig. 4.7). Indigenous peoples, most notably the Attawandaron, Anishinaabe, and Haudenosaunee, inhabited the area prior to European arrival. The region was progressively colonized by Pennsylvania Mennonites, and then by English, Irish, Scottish, and German immigrants, beginning in the early nineteenth century. In recent years, fresh immigrants to the region have continued to arrive from all over the world. Over the previous 15 years, the region's population has grown at a 1.6 percent annual pace. It also has thriving technology and financial industries, which continue to attract immigrants from both inside and outside of Canada. The metropolitan hubs are known for having the largest density of start-up companies in Canada, second only to Silicon Valley in the United States. Waterloo Region has the greatest location quotients in Canada for aerospace vehicles, defense, information technology, and analytical instruments (Region of Waterloo, 2018). The larger Toronto-Waterloo corridor is frequently cited as one of the world's greatest start-up company ecosystems (Genome, n.d.), and the region is home to Google's most renowned R&D headquarters in Canada.

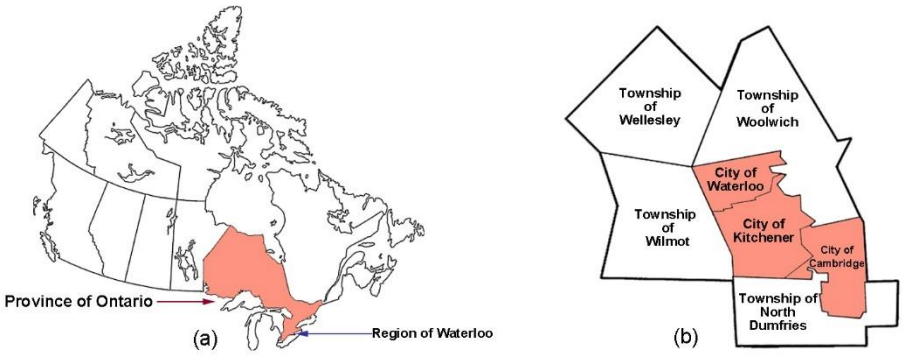

Figure 4.7 (a) The Province of Ontario in Canada and (b) the Region of Waterloo in Ontario comprise urban areas (in orange: The Cities of Waterloo, Kitchener, and Cambridge), and rural areas (in white: The Townships of Woolwich, Wellesley, Wilmot, and North Dumfries).

The rural areas around the denser population centers have a long agricultural legacy that is still practiced today. While the number of farms and the amount of land cultivated across Canada is declining, the number of farms in the Region of Waterloo has remained relatively steady. Farms in the region earned $564 million Canadian dollars in sales in 2015, a 16 percent increase from 2010. The region's rural townships are home to a prominent Mennonite cultural tradition that has

recreated distinct agricultural land-use patterns from the past, such as mixed crop agriculture, horse-and-buggy transportation, forested area maintenance for firewood, and maple syrup production based on the limited and often self-generated use of electricity. There are also more sophisticated farms in the vicinity. It should be highlighted that there is significant theological and institutional variability, resulting in various faiths expressing nuanced and dynamic interpretations of scripture and ethics; painting the entire cultural landscape with a single brush would be disrespectful.

The rural townships' undulating drumlin topography is also essential for the preservation of municipal water recharge. It is one of the largest groundwater-based systems in Canada, with groundwater providing nearly 75% of drinkable water (GRCA, n.d.). In addition, the area is bisected by many rivers with cultural significance, including the Grand River and one of its major tributaries, the Nith River (Fig. 4.8). 1994 saw the nomination of the Grand and Nith Rivers as Canadian Heritage Rivers. However, designation as a "heritage river" does not provide legal jurisdiction to regulate or restrict economic growth at these locations (GRCA, 2020). The Haldimand Proclamation granted the Haldimand Tract, which encompasses roughly 10 kilometers on each side of the Grand River, to the Six Nations2 (1784). These territories were granted to the Six Nations as compensation for the territory they lost during the American Revolution while allied with the British Crown. However, since the proclamation, almost all of the lands of the Haldimand Tract, including those in the Waterloo Region, have been sold, resulting in active legal efforts from the Six Nations alleging that the Crown failed to honor the treaty, violated the federal Canadian Indian Act, committed fraud, and illegally sold the land (Six Nations Council, 2008).

Figure 4.8 Left: The West Montrose Covered Bridge in the Township of Woolwich. Right: A view of the Nith River dissecting an agricultural property (DeGeer & Drescher, 2018).

4.3.2. Climatic conditions of the region of Waterloo

The climate in Canada varies considerably. The region of Waterloo has an average yearly temperature of 7.6 degrees Celsius (1999–2019). July is the hottest month of the year, with a mean temperature of 20.9°C, while February is the coldest, with a mean temperature of -10.3°C. The region's mean annual precipitation (1999–2019) is 974 mm, with the majority of precipitation falling in July (Fig. 4.9).

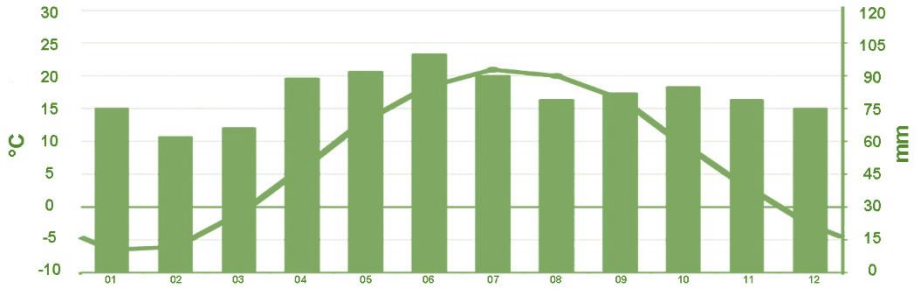

Figure 4.9 Temperature and rainfall averages for the Region of Waterloo from 1999 to 2019 (Climate Data, 2021b).

Between 1948 and 2016, the yearly average temperature in Canada climbed by 1.7°C. By the end of the 21st century, it is anticipated that these temperature rises will continue and reach 6°C (Bush & Lemmen, 2019). In addition, the IPCC's projection scenarios anticipate that the Region of Waterloo's mean temperature, heatwave length, and heatwave intensity will increase by 2050. (MECP, 2016). During the summer months, more acute drought and heat can cause higher mortality and decreased growth rates for certain agricultural crops (Lu et al., 2019) as well as other societal and ecological repercussions. Similar to Cinque Terre, Southwestern Ontario is witnessing an increase in the intensity, duration, and frequency (IDF) of precipitation events, with all-climate predictions predicting an increase in days with heavy precipitation (MECP, 2016). The increasing intensity distribution function (IDF) of precipitation events may have significant implications for stormwater management and infrastructure and result in delayed field planting due to excessive soil moisture and field flooding (Wuebbles et al., 2019), which may be offset by a longer growing season (MECP, 2016). Changes in agricultural activities may strain stormwater management systems even further. In Ontario, diversified livestock-based agricultural systems have given way to tile-drained cash crop agriculture, dominated by soybeans and corn. This shift in agricultural productivity has resulted in a clear rise in nitrogen pollution and perhaps an increase in surface runoff from fields to recipient streams and lakes, particularly during heavy winter

rainfall and melting events (Eimers et al., 2020). Consequently, good stormwater management is essential to Ontario's adaptation to climate change. This involves controlling land use upstream to reduce pressure on infrastructure and communities downstream.

4.3.3. Governance and management system

The Regional Municipality of Waterloo is an administratively superior municipal body (similar to a county) made up of seven lower-tier municipalities (three cities and four rural townships). The Official Plan for the Region establishes a framework and a set of guiding principles for coordinating the social, environmental, and physical planning of all municipalities below the county level. In 2005, after the release of the Provincial Policy Statement, the Regional Municipality of Waterloo began the process of identifying cultural heritage landscapes. The Planning Act of the province of Ontario regulates the Provincial Policy Statement, which outlines provincial concerns that local governments (i.e., municipalities) must also adhere to (Shipley & Feick, 2009).

4.4. Comparisons between the Cinque Terre and Waterloo regions

I examine two cultural landscapes in Cinque Terre, Italy, and the Region of Waterloo, Canada, to determine how these sites have included a participatory approach to their cultural heritage landscape conservation frameworks and planning procedures for climate change adaptation.

Feature	Cinque Terre, Italy	Region of Waterloo, Canada
Area	38 km2	64 km2
Population	3,700	562,000
Governance and policy-making framework	The national park entity subject to the Minister of the Environment's supervision	administratively superior municipal authority
Natural features	Hilly-mountain areas, very steep slopes, deeply cut valleys.	Rolling drumlin topography, two Canadian Heritage Rivers, deciduous forests
Land use	Mandarino et al. (2020) distinguished the land use of Cinque Terre in terms of cultivated, plants, forest, and unterraced areas (Raso et al., 2020)	Rapidly growing urban cores with developed manufacturing, education, technology, and finance sectors; predominantly agricultural land uses surrounding urban cores with significant aggregate resources,

		golf courses, and natural heritage areas.
Type of region	Coastal zone, marginal agricultural lands, rugged morphology	Inland, prime agriculture lands, rolling hills
UNESCO designation	Designation (1997) as a cultural, evolved organic landscape (criteria ii, iv, and v)	None
Climate	Mediterranean climate with hot, dry summers and temperate winters	Humid climate with hot summers and cold winters
Climate change impacts	Significant local flooding in October 2011, landslides, and an increase in warmer periods	Extreme precipitation (local flooding), heat waves, and short-term drought are all on the rise.

Table 4.4 Comparative description of study sites

The examination of the case study consists of three phases: I the literature context, (ii) the organizational setting, and (iii) the practice context. Intriguing comparisons may be made between these two research locations because of the significant disparities in their criteria for protecting cultural landscapes and the sorts of climate change consequences. Table 4.4 presents the specific features of each research location. I describe how landscape planning tools might encourage local community involvement in cultural heritage conservation activities and thereby improve the climate resilience of cultural landscapes.

Chapter Five

Developing Resilient Strategies for Reducing Climate Change Risks in Cultural Landscapes

5.1. Understanding Disaster Risk Reduction from international standards

The International Strategy for Disaster Reduction of the United Nations may guide the process of enhancing cultural landscapes' resilience to natural disasters. The Sendai Framework provides a strong basis for future action and execution. The following pillars, according to the conclusions of this study, are essential for enhancing resilient-based planning and its incorporation into the cultural landscape management plan.

To lessen the risk of natural catastrophes in cultural landscapes, governments must first allocate resources more effectively, be more open, and use technology for measuring, recording, monitoring, data analytics, and communication.

Second, in accordance with article 17 of the sustainable development goals (SDG), "Revitalize the global partnership for sustainable development," a platform of partnerships between governments, the corporate sector, and civil society should be formed in order to meet the SDG commitments (United Nations, 2015). Goal 17 is associated with governance, which is defined as the total of how public and private persons and organizations handle their shared concerns (Cichos, 2022). To achieve the Sustainable Development Goals (SDGs) by 2030, it is emphasized that the international community should strengthen the global partnership for sustainable development, with multi-stakeholder partnerships supplementing and sharing knowledge, expertise, technology, and financial resources at all levels – international, regional, and national. Governance in cultural landscapes necessitates implicit policies with a comprehensive multi-scalar approach that promotes the distribution of political power. There is a need for top-down, bottom-up, and spatial agreements and structures that democratize local community organization while boosting

development capacity and reducing the risk and susceptibility of physical, social, and ecological systems to climate-related calamities and resource shortages (Torres-Lima et al., 2019).

Thirdly, the active participation of many sectors, such as governments, civil society, communities, data scientists, and environmental scientists, is crucial for the implementation of the Global Standards for Disaster Risk Reduction in cultural landscapes and the improvement of resilience. Nonetheless, due to its different sources and approaches, resilience and its operationalization are somewhat contradictory. This discrepancy is due to the fact that resilience is a term that transcends several disciplines, including engineering, ecology, and risk management. Due to this disciplinary and conceptual uncertainty, including resilience into risk management techniques is likely to be challenging. In reality, the concept of resilience has difficulties in formalization, making it difficult to put theory into practice (Reghezza-Zitt et al., 2012). Resilience must be (re)defined and evaluated based on "perceived risks" in cultural landscapes in order to be operationalized. Consequently, it is essential to create suitable metrics in order to quantify cultural landscape resilience.

According to Mutiarni et al. (2022), the engagement of the local population is an essential component of a resilient landscape, depending on its specific features. Nonetheless, more efforts are still necessary to incorporate the local population into disaster risk management (Mutiarni et al., 2022). Utilizing traditional knowledge in planning practice contributes significantly to catastrophe prevention and mitigation, resulting in a more sustainable future. New building and restoration work may be carried out with higher efficiency and effectiveness if the knowledge learned from prior restoration projects and what has shown to be resilient in the face of natural catastrophes is applied. A history of knowledge that has been passed down through generations enables certain groups of people to notice minute changes in the environment or in behavior and to prepare themselves accordingly (Jigyasu et al., 2013).

Fifth, for resilience planning to be effectively integrated into cultural landscape management plans, inclusive and collaborative planning processes are necessary. Over time, participatory techniques will allow regional planners to better comprehend the socio-ecological dynamics of cultural landscapes and develop resilient management strategies. Consequently, it appears essential to isolate the various players from one another and the current instruments for promoting collaboration among varied stakeholders. When discussing collaboration and consultation, the

question of with whom arises first. Should each stakeholder be included at each step of the project? In this setting, it is essential to distinguish between participation and cooperation. Citizen involvement refers to people and groups who lack official decision-making authority; yet, participation is the mobilization of several individuals or organizations working together on an equal basis (Toubin et al., 2015). Participation, not equal to decision-making authority, is the focus of general public debates and queries on complex problems, and this should be made plain to all relevant parties. On the other hand, when many decision-makers collaborate, even if they do not work for the same company, we may speak about collaboration and successful cooperation at multiple levels. In fact, the common denominator between these two approaches—participatory and collaborative—remains a process of learning and creativity that integrates multiple sources of information—whether tacit, explicit, experiential, or academic knowledge—to improve resilience planning in the context of cultural landscapes. The development of a huge network of knowledge and relationships is aided by shared experiences and imitation. Collaboration formulae and tools will enable stakeholders to communicate and comprehend one another more effectively.

5.2. Climate change and the definition of cultural heritage

The international charters and guides on preserving cultural heritage show that this idea has changed over time based on what has been seen and learned at world heritage sites. Professionally, the meaning of "cultural heritage" has changed over time. It used to mean just one monument, but now it includes a group of properties and sites, historic cities, and cultural landscapes. The modern way of doing things expands the idea of heritage even further to include things that can't be seen or touched. This means all of the knowledge that comes from the development and use of practices, representations, expressions, skills, and ways of doing things, as well as the objects and spaces that people see as part of their cultural heritage.

But preserving cultural heritage is getting harder because climate change and its effects are always uncertain and can only be understood based on predictions. Climate change's long-term effects on world heritage sites may be one reason why UNESCO and its advisory bodies have not come up with a clear solution to this threat. In this way, we can even look at the submitted State of Conservation reports, which say that changes in weather patterns are not a threat in 70% of the cases. In line with this, most of the research done by UNESCO and its advisory has seen cultural heritage as a fixed idea based on the World Heritage Convention. This makes it hard to know how

well climate-resilience strategies work. In the case of cultural goods, one way to make heritage more resilient could be to use new methods that contribute to the long-term use of heritage buildings, like rehabilitation, renovation, or long-term monitoring (Haugen et al., 2018). However, the preservation of cultural heritage also depends on the environment and natural goods. This means that heritage policy needs to be set on a larger scale.

Climate change is altering population balance, biological processes, and the growth of multicultural communities around the globe (O'Brien, 2011). As a result, the idea of cultural heritage can no longer be described as a fixed asset in time, and its value assessment system requires change. Given that climate-resilient policies are produced in relation to a valuation framework, revisiting the notion of valuation and debating valuation evaluation may be seen as the most important step in the implementation and efficacy of climate-resilient policies. Each heritage site is currently under threat from particular climate change consequences, necessitating diverse management decisions and measures in response to trends and occurrences, management strategy, resource priorities, financial realities, staff expertise, and visitor access.

In the face of climate change, the availability and availability of resources will be vital to the landscape's long-term viability. At a glance, there are a number of regional sources that, if not appropriately managed, jeopardize the landscape's survival in a changing climate. The instability of socioeconomic processes, on the other hand, affects the survival of cultural heritage. So long, the conventional and conservative perspective has characterized heritage sites as a limit that must be preserved in their original form under any circumstances. It is suggested that resilience thinking provides fresh perspectives to planning, allowing it to define and address the complexity and uncertainties inherent in comprehending and analyzing urban systems (Sharifi & Yamagata, 2018b). Before any planning or consideration of the different ramifications that may follow traditional conservation principles, such as high maintenance costs or the possibility of being abandoned, attitudes about cultural assets must alter.

Therefore, it should be evident how a changing and diversified community can value cultural assets on a territorial scale and then establish climate-resilience strategies. Since the scope of social change and landscape characteristics varies from place to place (Trombulak & Baldwin, 2010), cultural heritage should no longer be defined on a universal and traditional conservative basis, but rather by considering its role as a useful resource and an acceptable characteristic of landscape

with real functions, such as catalysts for enhancing the quality of life, culture, and identity, or economic activities at the territorial level. Such an approach facilitates good communication between stakeholders and efficient interaction with other regional resources from the perspective of urban planning. Such a territorial planning and preservation perspective provides cultural heritage a new position as a contributing component for strengthening the landscape's resilience capability, as opposed to being a significant burden for the government or the local population. Thus, an intelligent and dynamic approach to cultural heritage, from conservation to preservation, static to dynamic, valued to is valuing, and isolated to the contributor, may play a positive role in achieving a broader and more complex climate-resilient environment. Such foresight may necessitate a territorial development cycle structure, as seen in Figure 5.1.

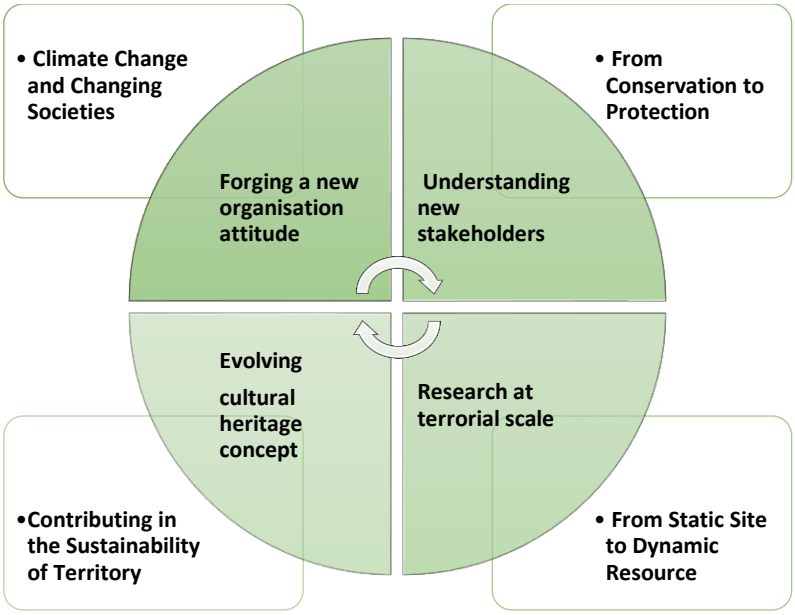

Figure 5.1 The cycle of defining cultural heritage as a territorial resource under the spotlight of climate change

The following are the primary factors in this cycle for mitigating the impact of climate change:

- Creating a new organizational attitude: Adopting a territorial planning approach to cultural heritage protection rather than a standard conservation method, based on a more thorough and accurate knowledge of the interaction between cultural heritages and natural resources.
- Understanding new stakeholders: Learning how stakeholders value cultural heritage is critical to the efficacy of climate-resilience policies and conservation objectives.

- Territorial scale research: Identifying and connecting available and legitimate resources in the region, as well as cultural heritage and natural resources.
- Bridging existing gaps and reframing cultural heritage from a dynamic and territorial planning standpoint, not only for its protection against climate change but also for emergency preparedness and disaster risk reduction.

The focus of cultural heritage policy should be on landscape and territorial scales in order to advise the management of natural and cultural resources and facilities. The most important aspect of redefining the protection policies is the synthesis of current information, research, inventory, and monitoring, as well as the dissemination of pertinent information to managers and stakeholders to facilitate decision-making. This strategy is comprised of four steps: linking effects and information, comprehending scope, integrating practice, and learning and sharing (Melnick et al., 2017).

Climate change frequently exposes long-standing preservation difficulties rather than introducing new ones, yet the save-all approach to the historic environment must be reconsidered (Cassar, 2005). Applying such a territorial vision also helps to manage priorities and regional decision-making in response to climate change, when cultural heritage becomes a heavy burden on the government or local community in its traditional and conservative way of thinking, as it requires significant funds for maintenance or restoration, funds that are never adequately or continuously available (Feilden & Jokilehto, 1998). This strategy can also give more study possibilities on the issue and link policymakers, heritage organizations, institutions, research centers, historic site managers, scholars, and others interested in cultural heritage protection (Sesana, Gagnon, et al., 2018a). Given the effective role of stakeholders in defining cultural heritage value from a territorial perspective (Chmutina et al., 2016), this study emphasizes the critical role of education and knowledge exchange across a wide range of stakeholders (ICOMOS, 2019b), including heritage management, transdisciplinary research, and climate science. This understanding supports local community involvement in cultural heritage resource conservation (Bertolin, 2019), and provides an influential foundation for reimagining the cultural heritage concept and climate-resilience strategies in the era of climate change. This policy should incorporate innovative techniques that promote multi-scale and multi-sector activity based on the various expectations of a diverse range of partners, as well as broaden the breadth of community participation and engagement.

The current vision for the conservation and management of heritage resources in central Italy remains very close to the traditional paradigm that accords tangible heritage areas intrinsic value, deserving of great efforts for collection, cataloging, and preservation in light of the likely restoration of damaged heritage. However, both heritage preservation and climate change mitigation are dynamic fields of study, and before designing climate adaptation strategies, it is vital to explore the significance of cultural heritage in light of climate change.

Viewing heritage resources through the lens of the cultural landscape, according to the findings, provides a complete framework for the prudent creation of adaptation policies. According to UNESCO, historical aspects play an important part in the development of the cultural landscape and may be classified into three types: clearly defined, organically developed, and associative cultural. In contrast, the European Landscape Convention focuses on the social values of the cultural landscape that distinguishes and distinguishes a society. The cultural landscape, according to this concept, provides a comprehensive picture - a place, as seen by people, whose character is the outcome of the activity and interaction of human elements and natural resources. Furthermore, the local economy is linked to landscape resources in numerous ways, according to this vision: through resources related to the production of food, energy, raw materials, and water (farming, forestry, fisheries, water supply), and through the tourism sector. The European Landscape Convention advocates for a community-based valuing system. It also emphasizes the strategic significance of cultural and natural commodities in preserving the cultural landscape. Cultural legacy may be characterized as a system of synergistic linkages between distinctive aspects of the physical environment, built environment, and anthropic environment from the perspective of territorial planning (Magnaghi, 2013). As a result, adaption plans must be developed within a framework of cultural and natural heritage conservation that appropriately addresses all three characteristics in an integrated manner.

The analysis of climate change impacts on central Italy (Fig. 4.6) demonstrates the landscape's different sensitivity to environmental threats. From the perspective of territorial planning, developing climate-adaptive policies and mitigating the effects of natural risks entails not only conserving the physical features of a heritage site, but also recognizing and protecting socioeconomic activities that are linked to cultural, natural, or world heritage sites. The socioeconomic changes caused by climate change can have a substantial impact on cultural landscape conservation. Climate change impacts on socioeconomic dynamics require heritage

sectors to quantify the damage cost of climate change on the cultural landscape and be fully aware of how this damage may be avoided via adaptation strategies that create capacity and resilience. A vision like this would transform cultural heritage from an isolated place into a territorial resource.

Central Italy should include the European Landscape Convention in territorial planning systems in order to improve the adaptability of cultural landscapes. This combination allows for the use of interdisciplinary and multi-sector views in dealing with preservation concerns, while also taking into account the specific morphologies of cultural landscapes in this area. For example, if agriculture is fundamental to a cultural landscape's identity, understanding farmers' perspectives, defining challenges, and determining appropriate measures would be critical for designing climate adaptation policy. Adopting a territorial perspective in a framework for cultural and natural heritage conservation promotes the integration of innovative ways for adapting legacy resources to climate change. Such an approach promotes multi-scale and multi-sector activities that are grounded in the varying expectations of a diverse set of partners, and it broadens the breadth of community participation and engagement.

As a result, territorial planning enables communication among planning agencies, stakeholders, and academics in formulating adaptation strategies and mitigating the risks of climate change. Furthermore, under this view, cultural and natural heritage resources are dynamically appraised as beneficial features for the cultural landscape's sustainability. Such a territorial approach to historic resources, from conservation to protection, static to dynamic, valued to valuing, and isolated to the contributor, can play a critical role in climate change adaptation in central Italy.

The suggested framework for cultural and natural heritage protection (Fig. 5.2) not only supports national mitigation and adaptation plans, but also improves communication among heritage institutions, academic researchers, and the local population. Developing and executing adaptation strategies in such a framework, on the other hand, underscores the need for more study to address possible problems and dangers. Although this model acknowledges that some heritage resources will be lost due to climate change impacts, developing climate-adaptive policies will be difficult due to a lack of understanding of how vulnerabilities and the cost of climate change should be prioritized in the context of a cultural landscape.

A further aspect is that conservation organizations have varying degrees of readiness in terms of their capacity to adapt to climate change, and this condition can have a significant impact on the

evaluation, policymaking, and implementation phases. For example, despite the fact that local governments are the first responders for climate-related environmental threats (e.g., flooding), many towns may not be effectively equipped to deal with flooding. The majority of municipal authorities have a good awareness of flood concerns and their detrimental effects on cultural landscapes. However, they need extra knowledge, assistance, and education as they navigate the complexities of climate change and its effects on cultural treasures (Gary et al., 2013).

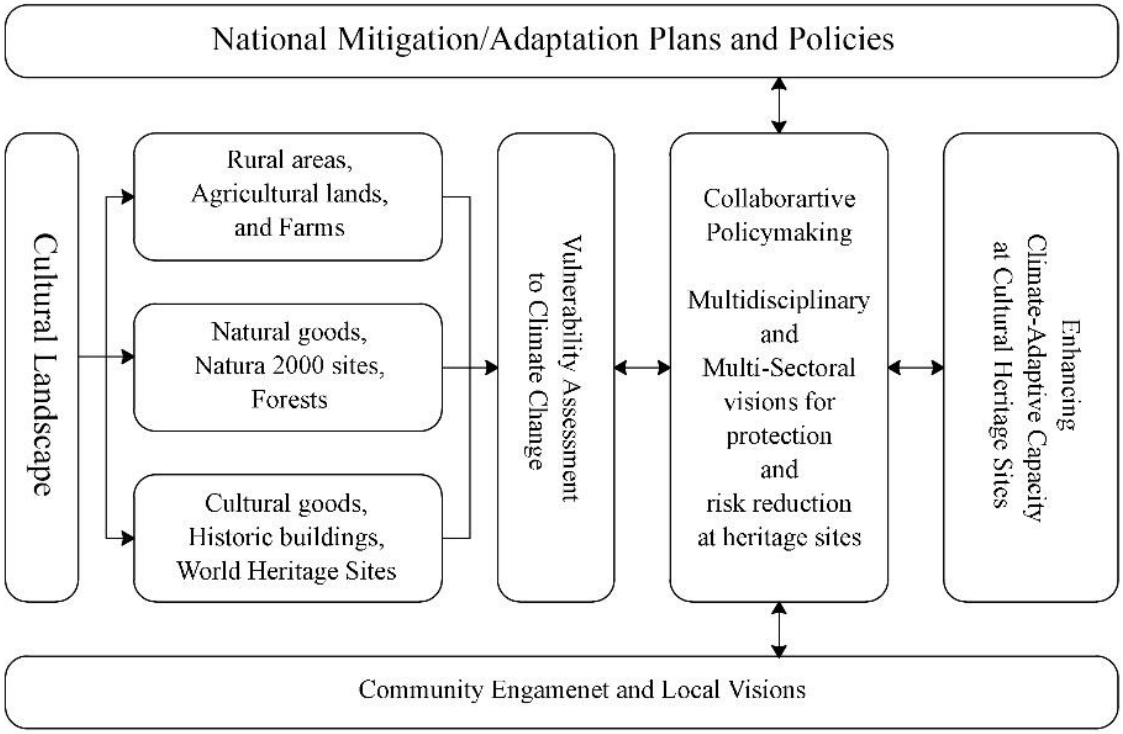

Figure 5.2 A framework for building adaptation capacity and sustaining of cultural landscapes

Existing research and the utilization of accessible social survey data show that the Italian public is generally aware of the significance of climate change, but climate change is regarded as less important than other economic concerns (Beltrame et al., 2017), particularly in terms of conservation measures. In terms of establishing adaptive ability in cultural landscapes, Italian residents rely mostly on the information given by traditional mass media, with environmental groups and scientific public communication playing a minor role. Some research has built disaster management cyberinfrastructure models (Asghar et al., 2006). Given the complexities of conservation issues in central Italy in terms of climate change, the cultural and natural heritage

conservation framework necessitates the development of a model for information exchange among citizens, public administrators, and the scientific community on a regional scale.

5.3. Cultural landscape and adaptation to climate change in Cinque Terre

Italy's agricultural sector has undergone a gradual deterioration over the past several decades. This deterioration, which has led to the abandonment of land in these locations, has had the greatest impact on mountainous regions. The persistent desertion trend can be explained by the decreased accessibility and profitability of these landscapes for modern agricultural agriculture (Pepe et al., 2019).

In Cinque Terre, man-made slope terracing has historically covered around 60 percent of the whole land (33 km2). Land abandonment has led to considerable changes in land-use patterns and agricultural techniques throughout the past century. From 1982 to 1990, more than 52 hectares of agricultural land in Riomaggiore and 24 hectares in Vernazza were destroyed owing to hydrogeological instability and the risk of landslides (Storti, 2004).

More than 77 percent of the terraced areas in the cultural environment of Cinque Terre have been abandoned. The abandoning phase has accelerated the terraces' fragility (Agnoletti et al., 2019; Brandolini, 2017). When there is no maintenance, the landscape's terraces become prone to soil erosion, displacement, and hydrological phenomena such as flooding (Fig. 5.3). The social and ecological viability of Cinque Terre is in jeopardy, according to Moreno-de-las-Heras et al. (2019) and Pepe et al. (2019), since residents live downhill from abandoned terraces that have been let to crumble down the slope (Moreno-de-las-Heras et al., 2019; Pepe et al., 2019).

Figure 5.3 Left: the cultivated terraces in Cinque Terre; right: drywall maintenance is a significant factor in managing hydrological risk.

In accordance with the Italian Republic's Constitution, the Republic consists of the State, Regions, Provinces, Metropolitan Areas, and Municipalities. In 2014, provinces were reformed. According to Article 114 of the Constitution, they are all independent authorities with restricted powers and tasks (European Comission, 2021). Each area is required by legislation (D. L. 42/2004 article 143) to develop a regional landscape plan. As part of a higher-level policy, the landscape plan trumps lower-level initiatives. Colavitti et al. (2013) claim that this type of top-down approach restricts the provinces' power to enact legislation in this area (Colavitti et al., 2013).

In addition, Cinque Terre is governed by two distinct agencies, the National Park and the Regional Park of Porto Venere, and municipalities, provinces, and the Ligurian Region are responsible for its management. The area implemented a new planning framework in 2019 that encourages multisectoral management methods. Municipalities actively participate in the decision-making and implementation stages through its coordination committee. The President of the National Park and the Mayor of the Municipality of Porto Venere designate a Cinque Terre site manager regularly for this purpose. The management techniques are supported by a group of professionals who provide guidance on the most recent research and management concerns (World Heritage Centre, n.d.-b).

Agricultural terraces in the Cinque Terre region are a historical, economic, and cultural heritage treasure, and if the depopulation process continues, it poses a significant threat to the area's viability. The terraced agricultural lands were constructed under different socioeconomic and climatic conditions than exist now. Due to land abandonment, the absence of maintenance of dry-stone walls and drain channels has exacerbated flood and landslide hazards in Cinque Terre (Schilirò et al., 2018). For instance, on October 25, 2011, a significant and intense rainstorm event in Cinque Terre caused extensive damage in the towns of Monterosso and Vernazza (Fig. 5.4). In addition, improper drainage might result in the creation of additional channels, hence accelerating soil erosion processes.

Figure 5.4 The flood of October 25, 2011, in Vernazza caused run-off, landslides, and the collapse of the terraced slopes (Brandolini, 2017).

The absence of dry-stone wall maintenance as a result of land abandonment and the resulting instability of the terraced slopes render the landscape susceptible to serious harm. According to Brandolini et al. (2017), in terms of climate change and geo-hydrological risk reduction, terrace management must be the major priority. When terraces are well-maintained, the risk of flooding is reduced for human settlements.

Many Italian areas have adopted preventative strategies to mitigate the dangers posed by natural catastrophes and climate change. For example, geomorphological mapping has been identified as an essential tool for risk assessment methods to handle floods and climate change (Mandarino et al., 2020) and landslides (Cardinali et al., 2002). The region of Liguria has created a technological model for the evaluation of hydro-meteorological risk in Cinque Terre (Poletti et al., 2017; Raso et al., 2019). It comprises four warning levels, from low (green alert level) to high (red alert level) (red alert level). Assume that rainfall-related threats are infrequent, with a minimal likelihood of harm for green and yellow warning levels. The orange warning level indicates a rise in river levels and a greater likelihood of floods and landslides during precipitation. The red alert level signifies a strong likelihood of catastrophic flooding and widespread landslides. This technique enables Cinque Terre officials to ban trail access during orange and red warning levels to prevent injuries and safeguard tourists from the dangers of extreme weather.

Many Italian regions have implemented preventative steps to mitigate the risks of natural disasters and climate change. Geomorphological mapping, for example, has been identified as a vital tool for risk assessment methods addressing flooding, climate change, and landslides. The Liguria area has created a technological-scientific model for assessing hydrometeorological risk in Cinque

Terre (Poletti et al., 2017; Raso et al., 2019). It has four warning levels, ranging from low (green alert level) to high (red alert level) (red alert level). Rainfall-related dangers can be anticipated to be infrequent, with a low likelihood of harm for green and yellow warning levels. The orange alert level indicates a rise in river levels, as well as an increased risk of floods and landslides during rains. The red alert level denotes a strong likelihood of major floods and widespread landslides. This approach assists Cinque Terre authorities in prohibiting tourists from accessing trails during the orange and red warning levels in order to minimize injuries and safeguard people from the hazards of extreme weather occurrences.

European Union law encourages decision-makers to understand the expectations of local communities early in the planning process and to include their interests in regional plans to assist in the execution and sustainability of planned strategies (European Union Directive 42/2001/EC). Although recent research has produced helpful tools and methods for climate risk reduction in Cinque Terre, the planning process has failed to incorporate the local community's demands and perceptions of climate change impacts that represent more severe hazards to the landscape. The Vernazza flood of 2011 can serve as a valuable illustration of why bottom-up interventions could be used as a starting point for redesigning cultural landscapes based on local community perceptions and needs. This concept seeks to control change and re-engage the cultural landscape in production uses through a bottom-up approach led by local residents.

5.4. Cultural landscape and adaptation to climate change in the region of Waterloo

Ontario is Canada's most populated province, a constitutional monarchy with a federal democratic system. The federal government is at the top of the Canadian political hierarchy, followed by the provinces, which include municipalities with their own elected governments. Several rounds of municipal amalgamations occurred in Ontario beginning in the 1990s, resulting in larger city and regional administrations. Regional governments, sometimes known as 'Regions,' are part of a two-tier municipal government system in which upper-tier regional municipal governments have authority over larger territories comprised of multiple lower-tier municipalities, each having its own local government. The exact responsibilities of upper- and lower-tier municipalities vary by region, but typically, the upper-tier municipality is in charge of municipal core services such as policing, waste management, and public transportation, while the lower-tier municipality is in charge of local economic development and land planning. In the Region of Waterloo, the regional

government develops an official regional plan that informs and constrains lower-tier government land-use planning.

In Ontario, cultural landscape planning is shared by the provincial and local governments, with municipalities' roles defined in a policy statement created by the provincial government called the Provincial Policy Statement (PPS). The PPS (2020) defines regulations on land-use planning and development that are both restrictive and accommodating, covering crucial parts of municipal planning for cultural heritage resources. The PPS directs municipalities to maintain cultural landscapes, which are referred to under the policy as "cultural heritage landscapes." The policy statement defines cultural landscapes as geographic places that can be environmentally developed while retaining their cultural worth in the view of the local population. This method of cultural heritage significance has been explored and assessed in lower-tier rural townships (DeGeer & Drescher, 2018; Drescher et al., 2019; Region of Waterloo, 2006; Shipley & Feick, 2009).

Waterloo Region is home to various colleges and universities. The University of Waterloo and Wilfrid Laurier University, in particular, have been significant in developing a regional understanding of the confluence of land use, sustainability, and climate change. DeGeer and Drescher recently employed a participative, bottom-up method for the Heritage Resources Centre at the University of Waterloo to identify prospective cultural landscapes for municipal designation in the region's two northern townships (DeGeer & Drescher, 2018; Drescher et al., 2019). Although each of the selected landscapes possesses key elements and behaviors for climate change adaptation, their climate change adaptation capabilities were not assessed throughout the stud (Fig. 5.5).

Figure 5.5 Local traditional food production systems result in reduced food imports and greenhouse gas emissions.

Climate adaptation planning has happened in conjunction with cultural landscape planning in the Region of Waterloo, with limited cross-fertilization between planning activities. Throughout its development, the region's Community Climate Adaptation (CCA) strategy incorporated participatory aspects, such as continuing contact with a core group of stakeholders and a chance for the general public to participate in an online poll. The CCA planning process resulted in a major aim of preserving, restoring, and enhancing the resilience of the natural environment and water resources throughout the region, which includes growing the use of natural areas and green infrastructure to control water run-off. The CCA plan explicitly recognizes the relationship between irreplaceable open spaces and associated green infrastructure, as well as other plans such as the Rural Water Quality Program and other sub-watershed plans, but it does not address the relationship between green infrastructure and cultural landscapes. Importantly, the CCA plan seeks to capitalize on possibilities to maintain riparian zones, wetlands, and other natural areas in order to assist manage stormwater and flood hazards, but it makes no mention of how cultural landscape design may serve in this capacity (MMAH, 2020).

Most participants in DeGeer and Drescher's (2019) study chose the Grand and Nith Rivers as prospective cultural landscapes, citing their picturesque vistas, natural qualities, and recreational options (DeGeer & Drescher, 2018; Drescher et al., 2019). From the standpoint of climate change adaptation, these rivers are an essential component of irreplaceable green open areas, offering significant ecosystem services such as water supply and water flow management (Böck et al., 2018). As previously stated, neither river's Heritage River designation includes any legal or regulatory provisions to regulate land development in these critical riparian corridors. While other land-use limitations exist, such as municipal bylaws controlling construction in floodplains and a role for conservation authorities3 in planning review procedures, rules prohibiting other types of development, such as golf courses and aggregate pits, are not accessible (Mitchell et al., 2014, 2021).

This is especially problematic given the climate change adaptation capacities of these socio-ecological systems and the diversity of values and heritage that exist in relation to riparian corridors (e.g., Indigenous, settler, and natural heritage values, as well as contemporary economic, recreational, and aesthetic values), which could be irreparably damaged by the cumulative effects of climate change and development pressures. In Ontario, the Heritage Act (which includes a cultural landscape policy) is one of the few pieces of legislation available to municipalities for

guiding aggregate resource extraction, which is otherwise largely determined by the province. Therefore, applying cultural landscape policy to these landscapes offers a relatively strong path forward. Thus, cultural landscape policy not only contributes to the preservation of the landscape's cultural and heritage assets but also enhances the ability of local decision-makers to control activities in open space areas and their related green infrastructure (MMAH, 2020).

The co-creative relationship between Mennonite agriculture and landscapes that perpetuate particular landscape characteristics (e.g., oat stooks in fields) and provide a local supply of fresh foods, food products, and crafts was another shared value among many survey participants (Fig. 5.6). Local decision-makers are able to control businesses that conflict with lifestyles fundamental to the (re)creation of these less intensive kinds of agriculture if the policy recognizes the values supplied by such cultural practices. Several participants in the survey criticized the approval of an aggregate operation near a Mennonite religious school; they feared that the operation and high traffic would harm children walking to school and put undue strain on the local community, possibly leading to emigration. Providing room for the maintenance of cherished traditions aids in the adaptation and mitigation of climate change. Local food production systems result in reduced imports and greenhouse gas emissions, perhaps lower inputs of fossil fuel-derived fertilizers and pesticides, and less dependence on internal combustion engines for conducting on- and off-farm activities (i.e., climate change mitigation). Inadequate conservation of less ecologically demanding kinds of agriculture — which are also crucial components of cultural landscapes — might thus weaken climate change adaptation and mitigation efforts already underway in the region.

Figure 5.6 Co-creative system between Mennonite agriculture and landscape provides a local source of fresh foods and food products.

Though there is plenty of room to improve these predominantly agricultural areas' adaptation capacities, recognizing and supporting the less-intensive agriculture that already exists in the region, as well as developing culturally sensitive policies to conserve those aspects of the socio-ecological system, would be an appropriate complement to the existing climate change adaptation planning processes. Recognizing and planning for the geographically overlapping values and uses of landscapes would be preferable, especially when cultural heritage and climate change adaptation capacities are mutually reinforcing. Doing so explicitly – rather than implicitly with multiple departments evaluating the functionality of landscapes in disciplinary silos – could lead to a more comprehensive and integrative account of cultural landscapes and provide landowners, community groups, and other decision-makers with the interdisciplinary lens needed to increase the climate change adaptation capacities of landscapes in a culturally sensitive manner while also reducing community friction with planning.

5.5. Comparing and learning from climate adaptation practices in Cinque Terre and the region of Waterloo

In terms of identifying cultural-historical value, population, density, and size, the two selected examples of Cinque Terre and the Region of Waterloo have basic contrasts. However, both locations are located in industrialized nations with strong democratic governments, which helps to reduce the complexity of the comparison and get a deeper knowledge of participatory planning in these cultural environments.

Comparing the Cinque Terre and Region of Waterloo research locations revealed significant parallels and differences. Both sites include significant cultural heritage treasures that are endangered by climate change and land-use modifications (Table 5.1). In contrast to the slower, long-term consequences (temperature rises) being observed in the Region of Waterloo, the climatic impacts in Cinque Terre are perhaps more evident, and severe occurrences (such as excessive precipitation) are encountered.

		Cinque Terre, Italy	Region of Waterloo, Canada
Cultural Landscape Identification	Features	Coastal Mountains Several small villages	Rolling drumlin topography Agricultural, rural, and urban regions
	Values	Aesthetic	Aesthetic

		Historical Cultivated Terraces	Spiritual Environmental
	Heritage Designation	UNESCO World Heritage Site	Federal, provincial, and municipal designations
	Main drivers of land-use change	Climate change Abandonment and unstable terrace slopes Population decline	Climate change Surface water run-off Land price increases Population growth
Assessment of Adaptive Capacity	Impacts	Decreased agricultural productivity Difficult land accessibility	Development pressures Shifting agricultural practices
	Economic resources	Insufficient financial resources for maintenance of all cultivated terraces in the long term	Climate adaptation and cultural landscape planning are largely funded through municipal taxation
	Technical resources	Geomorphological mapping is recognized as a tool but has not been implemented yet	Dispersed technical resources in both public and private sectors, accessed through participatory planning
	Disaster risk management	Risk assessment has been requested by UNESCO as an integrated part of the management plan	2018 Risk Assessment Report for the Waterloo Region Community Climate Action Plan; considers cultural aspects as well as ecosystem function
	Information and awareness	Need for specialists with technical skills in conservation	Generated through participatory planning and top-down assessments
	Leadership	The community recognizes the managers	Municipal governments
	Management capacities	Climate change is not integrated into the management plan	Climate change adaptation and cultural landscapes are considered independently
	Communication and Collaboration	Community engagement but not related to climate change	Community engagement for cultural landscapes and climate adaptation, but not integrated
	Governance	Regional and provincial level	Municipal and provincial governments, local community groups, individuals

Climate Adaptation Planning for Cultural Landscapes	Climate change risks and extreme events	Extreme Rainfall and Flooding Landslides Soil Erosion Warmer temperatures, with high-wave events	Slow temperature increases Flooding Heatwaves Dry spells
	Conservation framework	UNESCO Convention of 1992 European Landscape Convention	Provincial Policy Statement and municipal policies and reports
	Barriers to participatory climate adaptation planning	Lack of community engagement Lack of dissemination of knowledge (awareness of the impact of extreme events but less awareness of the consequences of gradual degradation)	Little cross-fertilization between climate change adaptation and cultural landscape planning Departmental silos within municipal offices Funding limitations lead to a limited scope of assessments

Table 5.1 Case study analysis of the cultural landscape identification, assessment of adaptive capacity, and climate adaptation planning at each study site.

In addition to disparities in biophysical features, we discovered significant cultural landscape differences between the two case study sites. In the Territory of Waterloo, many federal, provincial, and municipal designations have been applied for or are being considered for smaller portions of the region. Second, Cinque Terre is suffering a decline in agricultural output, land abandonment, and population declines, whereas the Region of Waterloo is witnessing an increase in agricultural production and population growth.

In terms of obstacles to a participatory approach to climate adaptation in cultural landscape planning, Cinque Terre demonstrates a lack of community engagement in planning practices due to a "top-down" approach to protecting cultural landscapes, as well as inappropriate dissemination of knowledge on climate change effects. In general, knowledge of extreme climate events is greater than understanding how these occurrences gradually degrade the terrain. Climate change adaptation and cultural landscape planning in the Region of Waterloo feature "bottom-up" aspects and are unfolding in parallel, but are not well integrated. The departmental tasks of municipal

agencies and financial constraints can result in the addressing of specific concerns, but they impede a holistic approach and limit the breadth of assessments.

5.6. Toward a bottom-up approach to participatory adaptation in cultural landscapes

Over the last four decades, the UNESCO World Heritage Convention and its operational guidelines have created a solid foundation for the international conservation of cultural heritage landscapes (Shirvani Dastgerdi & De Luca, 2018c). A cultural landscape is defined by the 1992 UNESCO Convention as a system consisting of the interaction of people's cultural expressions and natural resources. Such a system can demonstrate adaptability to change, for example, through sustainable land-use practices. However, the existing state of a cultural landscape should not be seen as the last and static stage of its growth. Conservation policies must acknowledge the processes that created these regions and have kept them alive and adaptable (Di Fazio & Modica, 2018). These considerations become even more crucial when extreme weather events and other long-term climate changes touch these locations.

A collection of actions, such as identification, conservation, and monitoring, characterize the management process for World Heritage cultural landscapes. Indeed, by incorporating the proposed visions of the European Landscape Convention, we can reclaim a broad definition of cultural landscape management that is not limited to physical in situ actions (e.g., traditional cultivation practices), but includes the full range of measures, such as participatory planning and resilience.

Cultural landscapes "as perceived by people" imply that cultural heritage protection must go beyond the viewpoints of an academic or political elite and instead incorporate all stakeholders' perspectives into practices and laws (Jones, 2007). Prior research has indicated that community-based natural resource management and local empowerment – such as the involvement of local non-governmental organizations, cooperatives, advocacy groups, and self-help groups – give an opportunity for active community engagement in landscape planning (United Nations Development Programme, 2016). To ensure the function and sustainability of cultural landscapes in a changing context, cultural heritage conservation strategies must be backed by local Indigenous and other inhabitants' expertise as designers and developers of the landscape, in addition to advocating international standards. A conservation-minded ethic created locally, in particular, has

greater credibility and long-term influence than one required by distant governments or outside groups. This view is consistent with Allred et al. (2016)'s applied social-ecological approach in Jamaica Bay, New York, which addresses the question of "resilience of what and for whom" (Allred et al., 2016; Walker et al., 2006).

In this chapter, I advocate for a bottom-up approach to protecting, conserving, or restoring cultural landscape-defining features through a four-step process of I identifying community needs, (ii) assessing adaptive capacity, (iii) engaging with the community, and (iv) disseminating knowledge among stakeholders (Fig. 5.7). The study findings are discussed in terms of each of these four phases in the sections that follow.

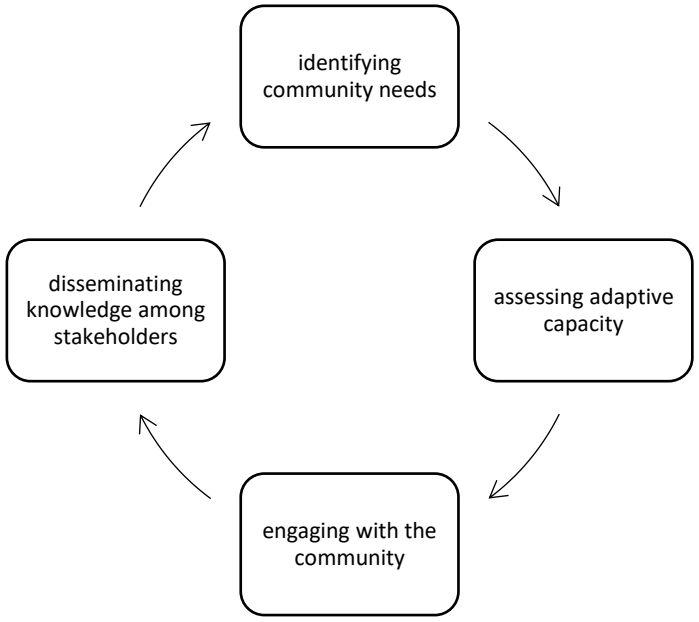

Figure 5.7 The bottom-up approach to participatory adaptation in cultural landscapes.

5.6.1. Community needs and perception of climate change risks

Although knowledge and technical expertise are important factors in constructing climate resilience in cultural landscapes, climate adaptation strategies must reflect the requirements of local stakeholders and promote a sustainable, local economy (Rezende et al., 2018). The UNESCO World Heritage Convention's strict conservation framework, declining agricultural economy, and facilitating access through mountainous terrains are the main reasons for the abandonment of cultivated terraces in Cinque Terre, which ultimately reduces the area's ability to buffer climate change risks. While creating a bottom-up strategy attentive to local needs and views may provide

a solution, the impact of sectoral planning systems can often be a barrier since they rely on a poorly developed system of plan revisions and updates. Because of the lengthy approval procedure, territorial plans are frequently designed as long-term instruments (static) (governance). Furthermore, the implementation of agroecological concepts typically focuses on the interplay of agricultural and environmental protection devices, with little regard for socio-cultural considerations. As a result, agricultural landscape conservation is dependent on a patchwork of legal and planning instruments from multiple sectors, the strategic aims of which are sometimes at odds (Dana Salpina, 2020).

In contrast, cultural landscape protection in the Region of Waterloo is based on provincial legislation (PPS and Ontario Heritage Act). While these pieces of law provide towns with potentially robust historical protection measures, they are applied to cultural landscapes extremely rarely and with much flexibility in reality. Cultural landscape designations, for example, are frequently used exclusively when governments or local communities detect plans for undesired residential or infrastructural developments or other land-use changes. This allows plainly unfavorable land-use changes to be regulated while more palatable land-use changes continue, allowing for a continual, organic evolution of the cultural landscape.

Cinque Terre and the Region of Waterloo's experiences emphasize the crucial significance of the local community's perception of climate change and understanding of predicted climate threats as a vital contribution to the landscape's resilience. These findings imply that community engagement may promote the socio-ecological capacity of resilience in cultural landscapes and support cultural values that recognize the uniqueness of each environment (Ramasubramanian, Menser, Rieser, Feder, et al., 2016). However, three key features of planning must be considered in order to facilitate meaningful engagement of the local population in climate change measures.

- First, with a bottom-up planning method, local engagement might introduce new types of decision-making disputes. However, the establishment of communication channels and opportunities for meaningful citizen interaction, such as online forums and surveys (Nordgren et al., 2016), may alleviate such difficulties.
- Second, there is a strong link between citizens' understanding of climate change threats (community readiness) and the preservation of cultural landscapes. When the local

community is engaged in analyzing climate change risks and adaptation capacity, it may become more viable to commit to climate change activities in cultural landscapes.

- Third, conservation measures must make it easier to pursue new economic activities in cultural landscapes. Human interactions with their natural environment have resulted in the evolution of cultural landscapes. Most of these relationships were fueled by various types of productive land usage that supported local people's livelihoods and well-being.

In the absence of such economic land use, cultural landscapes will degenerate into relict landscapes. If profitable land uses persist, they will evolve in response to changes in socio-cultural variables, technology, and conditions, including climate change. These changes will cause the cultural environment to evolve further, which cannot be stopped but must be handled.

5.6.2. Assessment of adaptive capacity in cultural landscapes

Understanding climatic risks and the adaptive ability to handle them requires seeing cultural landscapes as a complex and interacting system of natural and cultural factors. Because landscape character is always changing, frequent vulnerability assessments, maybe every five years, are required (Solecka et al., 2018). The practice of land abandonment and the absence of dry stone wall upkeep are two significant elements that raise Cinque Terre's vulnerability to climate change hazards. In Cinque Terre, the region of Liguria has used vulnerability assessment models (such as geomorphological mapping) and adaptation plans. The local community, on the other hand, was not involved in analyzing, implementing, monitoring, and evaluating adaptation initiatives. According to Gupta et al. (2010), establishing climate adaptation necessitates a new governance system that allows local people to learn about climate change from the ground up, develop policies, and put them into action (Gupta et al., 2010).

The capacity of cultural landscapes in the Region of Waterloo to adapt to climate change is exacerbated by other pressures. Primogeniture (inheritance by the firstborn son) and ultimogeniture (inheritance by the eldest son) appear to be Mennonite inheritance patterns, while nothing is known about them clearly and there is certainly variation across communities. This signifies that the land is passed down to the eldest or firstborn son. If the surviving boys wish for a farm and homestead, they must either get land as a gift or purchase it elsewhere. Changing land-use patterns and rising land prices make it increasingly difficult for Mennonite farmers in the region to acquire additional property. Impacts of climate change that enhance the unpredictability

of agricultural production may contribute to these stresses. In recent decades, farm sales and the movement of Mennonite farmers to northern Ontario have happened, which may be largely linked to these dynamics. Regional climate change adaptation strategies do not, however, appear to address the cultural components of these interactions. This assessment appears to confirm the hypothesis of Sesana et al. (2020) that the majority of decision-making processes for cultural landscapes use a top-down approach, which is why locally-informed climate change vulnerability assessments are rarely incorporated into adaptive management plans for these landscapes.

5.6.3. Dissemination and promotion of knowledge among stakeholders

Landscape planners should encourage multidisciplinary research methods to understand how people feel and how the environment changes (Reed et al., 2020). To make cultural landscapes more resilient to climate change, local governance needs to be backed up by knowledge from the local community. This knowledge can be used to start strategies that deal with socio-ecological and climate change risks. The planning process can be improved by making it easier for researchers, the community, and other experts to share what they know about different climate scenarios (Adade Williams et al., 2020). Knowledge exchanges also give the local community a chance to be involved in the spreading process.

Based on my analysis of Cinque Terre and the Region of Waterloo, I think that planning for integrated cultural landscapes and adaptation to climate change should be done in a more participatory way. As explained in the Region of Waterloo case study, cultural landscape policy can be used to protect riparian areas and other natural areas that are important parts of green open spaces without damaging the socially and culturally valuable parts of the landscape. Importantly, if planning for adaptation to climate change and planning for cultural landscapes were done together, areas of conflict (like building flood control dams in cultural landscapes) could be found and trade-offs could be made. Since the cultural landscapes in the Region of Waterloo are still in the early stages of protection and Cinque Terre is mostly a relict landscape that has been protected for over 20 years, lessons can be learned from Cinque Terre about how to protect cultural landscapes while adapting to climate change.

Cinque Terre has proved that landscape change is inevitable and that policies that try to maintain landscapes in a state of stasis can damage the socioecological resilience of landscapes. Therefore, we recommend that cultural landscape policy give special consideration to the socio-ecological

system, which analyzes the relationships between institutions and the ecological, social, and economic characteristics of the landscape (Epstein et al., 2015). Dynamic environments necessitate dynamic, adaptable planning documentation. Those closest to the landscape are frequently in the greatest position to give a real-time and nuanced interpretation, which can result in several connected improvements for a landscape's shapes and functions.

5.6.4. Implementation of locally-based strategies

Multiple institutions participate in the decision-making processes in each region, each with its own institutional objectives, policies, strategies, stakeholders, information, and skills. These institutional inequalities might hinder collaboration on climate adaptation planning for cultural landscapes. Landscape planners might gain a better understanding of how to implement climate adaptation strategies in cultural landscapes if they investigate the effects of these institutional impediments (Beunen et al., 2020).

By analyzing the distinct cases of planning in Cinque Terre and the Region of Waterloo, my study analysis suggests the importance of governance and participatory climate adaptation at the local scale. Participatory climate adaptation policies need to minimize conflicts among local stakeholders. Furthermore, the implementation of bottom-up approaches could be tailored through the use of innovative and intelligent strategies such as (i) developing a centralized web platform for climate risk communication (Haugen & Mattsson, 2011); (ii) strengthening communication between policy-makers and communities (de Wit et al., 2019); (iii) supporting collaborative local governance (Bizarro & Alexandre, 2020); (iv) engaging in interdisciplinary landscape planning for disaster risk reduction (Bizarro & Alexandre, 2020); (v) developing and utilizing measurement tools for adaptation progress (Carmichael et al., 2020; Phillips, 2015); and (vi) investing in local learning and networking (Carmichael et al., 2020; Galappaththi et al., 2020) (Table 5.2).

Strategy	Description
Developing a centralized web platform with spatially referenced climate change risk information	Develop a web platform based on the input of local end-users to ensure it is useful and usable. All climatic data, potential risks, and new resources should be available on the platform. Securing funds to support the continued maintenance of the platform is essential (Haugen & Mattsson, 2011).
Strengthening communication between policy-makers and communities	To promote a mutual dialogue between policy-makers and the local community. The dialogue helps share knowledge on appropriate resource use and allows for the collection of stakeholder input (de Wit et al., 2019).
Strengthening the efficacy of collaborative local governance	Develop regional collaborations among local governments, NGOs, local communities, and other stakeholders to promote multi-jurisdictional cooperation on climate adaptation-related issues in cultural landscapes (Bizarro & Alexandre, 2020).
Increasing planning for risk reduction with a multi-sectoral vision	Engage professionals from various sectors, including experts in areas such as climate change, economic development, planning, ecology, community development, and infrastructure, to work on risk reduction and climate change adaptation planning (Bizarro & Alexandre, 2020).
Developing and utilizing measurement tools for adaptation progress	Develop methodologies to assess the adaptation progress of social and biophysical components of socio-ecological cultural landscape systems. The methodologies should be tailored to the local context and cover multiple sectors (Carmichael et al., 2020; Phillips, 2015).
Investing in local learning and networking	Hold regular online or in-person meetings and workshops involving adaptation professionals, local communities, landscape planners, and decision-makers. The goal is to empower local communities and professionals to engage in the planning process for climate change adaptation (Carmichael et al., 2020; Galappaththi et al., 2020).

Table 5.2 Potential strategies for supporting participatory climate change adaptation in cultural landscapes

Taking into account the aforementioned strategies, it can be argued that building climate adaptation in cultural landscapes requires a novel landscape planning framework that integrates essential factors such as the dynamic identification of values and community needs, assessment of

climate adaptive and learning capacities, access to climate change information among local stakeholders, and authority for the implementation of local strategies (Fig. 11). Our examination of Cinque Terre and the Region of Waterloo indicates that a portion of these elements has been considered. However, Cinque Terre and Waterloo have not yet fully included climate change measures in their regional plans. For example, despite the fact that the Liguria region has assessed the hydro-meteorological danger in Cinque Terre, Cinque Terre must acquire the municipal-level governance capacity to build its own cultural landscape plan based on the requirements of its community. In the Region of Waterloo, while the location of the planning authority at a lower government level is advantageous, it will be essential for the sustainability of strategic landscape planning processes to increase local community participation and incorporate their expectations into conservation practices.

5.6.5. Conclusions about a bottom-up approach to risk reduction in cultural landscapes

In this chapter, I attempted to comprehend the climate change adaptation experiences of the cultural landscape planning procedures of Cinque Terre, Italy, and the Region of Waterloo, Canada. I expect that the insights will assist policymakers in establishing place-specific, adaptable, and appropriate policies to protect, maintain, or restore the distinguishing characteristics of cultural landscapes (Fig. 5.8). In addition, we feel that the evidence presented in this research suggests that incorporating adaptation to climate change into the protection of cultural landscapes will be more effective when a bottom-up strategy is utilized in the territorial planning process. The shared significance of the landscape may guide the formulation of cultural heritage policy, which is true for both traditional cultural landscape management and climate change adaptation in cultural landscapes. In addition, such a bottom-up strategy would enable the development of novel agricultural management strategies that are more adaptable to the new climatic circumstances (Aznar-Sánchez et al., 2019) and help collect more information on the preferences and attitudes of stakeholders. In fact, future research may be interested in investigating how and why participation obstacles exist.

Conclusion and Rasing Open Questions

Prior to the 1970s, disaster risk was considered a direct consequence of natural hazards. Disaster risk is now regarded as a complex occurrence that lies at the intersection of risks, exposure, and the vulnerability of cultural landscapes. Risk management has progressively included the notion of resilience. Despite this, its definition remains unclear, and the term "resilience" is typically reserved for political discourse or the media, as opposed to being applied to specific activities. After decades of research and lessons learned from natural disasters, social scientists have introduced the social component of catastrophe risk, and it is now widely acknowledged that disasters are partially the result of human innovation. According to the European Landscape Convention, the cultural landscape is intrinsically related to humans and their interactions with both natural and man-made infrastructure. Consequently, human perception is intrinsically related to the landscape, and it is reasonable to assume that resilient planning will follow suit. Consequently, it is essential to understand the numerous meanings, origins, and interpretations linked with this concept. In the context of cultural landscapes, a participatory and collaborative strategy based on local expertise and applicable technology is most likely to result in long-term success in resilient planning and its implementation into the cultural landscapes management plan. In addition, resilient planning in cultural landscapes cannot be effective without well-functioning administrative and operational systems, institutions, and procedures.

Because adaptation is often done on a local level, involving stakeholders in figuring out how vulnerable people are to climate change can be helpful. Local stakeholders usually know a lot about heritage sites and how vulnerable they are to climate change. They also have the resources they need to be able to adapt to these vulnerabilities. So, local information about the risks of climate change is a key part of building adaptations in cultural heritage sites. Unfortunately, climate change is rarely included in plans for managing cultural heritage sites. This is because most research on climate change risks to cultural heritage has been done from the top down. Local

people should help figure out how vulnerable landscapes are to climate change. This means assessing risk from the bottom up.

Responding appropriately to climate change demands a community-wide effort from all stakeholders. It involves the integration and synthesis of a scientific understanding of climate change, models to anticipate the impact of climate change on natural and cultural heritage assets and an awareness of the implications of climate change for risk mitigation. As highlighted in this article, interdisciplinary research and conversations among the many heritage sectors and stakeholders should seek to establish technically sound and cultural landscape-sustainability-promoting beneficial techniques. In this regard, heritage adaptation strategies should prioritize landscape and territorial scales to guide the management of natural and cultural resources and facilities. The most important aspect of redefining the protection policies is the synthesis of current information, research, inventory, and monitoring, as well as the dissemination of pertinent information to managers and stakeholders to facilitate decision-making. This strategy is comprised of four steps: linking effects and information, comprehending scope, integrating practice, and learning and sharing. This study also identifies the regional research gaps necessary for our collaborative success in assessing the risk of heritage assets.

The World Heritage Convention has been an effective instrument for identifying cultural heritage and driving global conservation policy during the past few decades. In the past, the notion of cultural heritage was formed based on challenges encountered in a reasonably homogenous group. However, the current difficulty is that climate change and its impacts on cultural heritage will always be based on uncertainties and projections. This study concerns the effectiveness of climate-resilience strategies based on the conventional idea of cultural heritage and its conservative approach in light of the diversity of climate change's effects on cultural heritage locations. The outcomes of this study indicate a paradigm that values cultural heritage as a dynamic territorial resource in a contemporary diverse society. In this approach, communication between planning agencies, stakeholders, and academics organize the idea of cultural heritage in connection to other regional resources and adds to the efficacy of territorial climate-resilience policies.

Such a perspective not only safeguards the cultural heritage resources of a territory against climate change but also improves the landscape's resilience to natural calamities. However, establishing and implementing heritage policies within such a framework highlights the need for more study to

address possible difficulties and hazards. Despite the fact that this model recognizes the inevitability of the loss of a portion of the heritage resources due to climatic conditions, the inadequacy of knowledge regarding the prioritization of threats at the territorial scale remains a challenge for determining heritage policies in this model. Another element to consider is that conservation organizations have varying levels of readiness and equipment to adapt to climate change, which can impact the adoption and efficacy of climate-resilience policies in this model. In the suggested framework for the redefinition of heritage policies, it is of the highest significance to do more research on how to eliminate organizational conflicts at the regional level in identifying objectives and assessing stakeholder readiness for essential actions.

This study looked into methods for improving adaptive capability in cultural environments. Floods and landslides, according to my research, are two major climate-related threats that threaten central Italy. However, depending on their knowledge and abilities, as well as their institutional readiness, various towns have varying levels of sensitivity to these dangers. The notion of cultural legacy is further developed in this work as a system of synergistic linkages between the distinctive aspects of the physical environment, the constructed environment, and the anthropic environment. Climate adaptation policies must thus incorporate these three elements in order to be effective in maintaining and protecting cultural and natural assets. In this regard, I propose that the European Landscape Convention be considered as a suitable conservation framework for the creation of climate adaption policy. This treaty differs from the UNESCO vision in that it adopts a regional approach to cultural heritage. The European Landscape Convention considers the holistic and social landscape, but UNESCO's approach is less regional and less place-specific in its focus. Incorporating the European Landscape Convention into territorial planning also fosters dialogue among many sectors and stakeholders. Such a territorial strategy for historic resource protection can effectively lower the cost of climate change in terms of floods and landslides.

My study also demonstrates that various municipalities have varying levels of exposure to these hazards based on their knowledge, abilities, and institutional readiness. One explanation is that environmental groups and scientific public communication have little role in the climate adaptation of cultural landscapes. More study is needed to understand how territorial planning might decrease organizational conflicts in identifying protection objectives and assessing stakeholder readiness for essential measures in managing climate change and natural threats.

Cultural landscapes all around the globe are at risk due to the effects of global climate change. Conservation of cultural heritage sites has always been viewed as separate from the conservation of natural resources. To simplify the comparison, I focused on Cinque Terre and the Region of Waterloo as two distinct examples of cultural landscapes with a comparable governance system. I looked at ways to lessen the effects of global warming in both locations.

My research shows that many cultural heritage sites may still be managed from the top down, from figuring out what needs to be done to actually doing it. This may make it harder for them to adapt to climate change. Based on a socio-ecological approach, my thesis talks about how important place-based governance is for making cultural landscapes more resistant to climate change. Such a bottom-up approach to management supports inclusive and shared decision-making and gives the local community a chance to express its own cultural values, heritage resources, and sense of identity (Becattini, 2009; Sargolini & Pierantoni, 2020). I argue that nature and society are inextricably and mutually dependently linked in cultural landscapes and should be seen as part of an integrated social-ecological system. So, practices for preserving cultural heritage need to support and encourage the meaningful participation of Indigenous and other local communities to make sure that cultural landscapes continue to work and last as the climate changes.

The analysis of Cinque Terre and the Region of Waterloo showed some important things about how people can be involved in planning cultural landscapes in a meaningful way. Even though models for assessing vulnerability have been made in many parts of Italy, more research is needed to support their use and monitoring in cultural landscapes. Experiences in the Region of Waterloo show that planning for cultural landscapes and adapting to climate change can be more open to the public. But strategic planning processes will only be able to last if the local community is involved more and their expectations are taken into account in conservation work. So, to reduce the risks that climate change poses to cultural landscapes, we need a new landscape planning framework that takes into account value identification, community needs, the ability to adapt and learn from climate change, access to information, authority, and the implementation of local strategies. Several hypotheses for this purpose are explained below based on the findings.

1- Creating a centralized web platform for communicating climate risk

Several cities in Italy have used web-based platforms for local community participation in various initiatives, including climate change adaptation and cultural landscape planning. The city of

Florence has developed an online platform called "Partecipa Firenze" (Participate Florence), which allows citizens to participate in decision-making processes related to urban planning, cultural heritage, and other issues. Milan has launched an online platform called "Participation Lab" to encourage citizen participation in various initiatives, including climate change adaptation. The city of Venice has developed an online platform called "Partecipa Venezia" (Participate Venice), which allows citizens to participate in decision-making processes related to urban planning, cultural heritage, and environmental issues. Turin has launched an online platform called "Partecipa Torino" (Participate Turin), which allows citizens to participate in decision-making processes related to urban planning, cultural heritage, and other issues. The city of Rome has developed an online platform called "Roma partecipa" (Rome participates), which allows citizens to participate in decision-making processes related to urban planning, cultural heritage, and other issues.

2- Improving communication between policymakers and communities

Communities must be involved in the planning and decision-making process, and their inputs must be taken into consideration while developing resilience strategies. Policymakers should use clear and concise language that is easy for the community to understand. They should provide the community with accurate information about climate risks and the potential impacts on cultural heritage sites and use multiple communication channels, such as social media, websites, and community meetings, to reach a broader audience and ensure that information is accessible to all. Policymakers should engage with local leaders, such as religious leaders and community organizations, who can help to disseminate information and mobilize the community. They should work to build trust with the community by being transparent, responsive, and accountable to their needs and concerns.

3- Supporting collaborative local governance

Collaborative local governance can help ensure that climate adaptation and resilience strategies are tailored to a community's specific needs and context and that they are informed by local knowledge and expertise. This approach can also help build trust between community members and policymakers, which can be critical for successfully implementing resilience measures. Additionally, providing training and support for local leaders and community members can help build capacity and empower individuals to take an active role in shaping climate resilience

strategies in their communities. It may involve training in areas such as risk assessment, disaster preparedness, and natural resource management.

4- Engaging in interdisciplinary landscape planning for disaster risk reduction

It involves bringing together experts from different fields, such as climate science, architecture, urban planning, and engineering, to work collaboratively on strategies to reduce the risk of disasters and build resilience in cultural landscapes. This approach recognizes that disasters are complex and multifaceted and require a holistic and integrated approach to address them effectively. By combining knowledge and expertise from different fields, interdisciplinary planning can help identify vulnerabilities and opportunities for risk reduction and resilience building and develop innovative solutions that are tailored to the unique characteristics and needs of cultural landscapes.

5- Creating and using measurement tools for adaptation progress

Measurement tools can include indicators that assess factors such as vulnerability, adaptive capacity, and resilience of cultural landscapes. By regularly monitoring and evaluating these indicators, policymakers and communities can identify successful strategies and areas for improvement and adjust their plans and actions accordingly. It can help to ensure that climate adaptation efforts are effective and ultimately lead to more resilient cultural landscapes.

6- investing in local learning and networking could be considered as leverage points to reduce potential conflicts among local stakeholders

investing in local learning and networking can be a way to reduce potential conflicts among local stakeholders. Stakeholders can work together towards a shared goal by promoting education and training programs that enhance the community's understanding of climate change risks and resilience strategies. These programs can also provide a platform for dialogue and information sharing between different groups, helping to build trust and foster collaboration. Additionally, creating networks of local actors involved in cultural heritage and climate change issues can facilitate sharing of knowledge and best practices, and help establish common goals and strategies for addressing climate change risks.

Efficient communication channels are essential for landscape planners to engage the local community and other stakeholders in the process of climate change adaptation and to prevent

possible conflicts that may arise from such measures. It is essential to ensure that all stakeholders are involved in the planning process, their concerns and ideas are heard, and that they are kept informed about the progress of the project. Effective communication can also help to build trust and foster collaboration between different stakeholders, leading to more successful and sustainable outcomes. In fact, there is a strong correlation between local residents' awareness of climate change risks (including their community preparedness) and the protection of cultural landscapes; local communities that are aware of climate change risks are typically more committed to climate change actions in cultural landscapes. In addition, the commitment of local people to the preservation of cultural landscapes will be strengthened when conservation policies generate new forms of economically viable enterprises that allow cultural landscapes to continue changing while preserving cultural values.

Talking about cultural landscapes and heritage when climate change is a factor means acknowledging the vulnerability of cultural heritage sites to the impacts of climate change, such as sea-level rise, floods, storms, erosion, and desertification. Climate change can have significant implications for conservation practices and call for a shift away from the current paradigm, which often prioritizes preservation of the physical fabric of cultural heritage over the social, economic, and environmental contexts in which it exists. For example, climate change can alter the traditional knowledge and practices of communities that have managed cultural landscapes for centuries, making it necessary to adapt conservation strategies to evolving environmental and social conditions. Climate change can also affect the integrity and authenticity of cultural heritage sites, potentially compromising their cultural and aesthetic values. To address these challenges, conservation practices must shift from a narrow focus on preserving physical fabric to a more holistic and dynamic approach that considers the broader cultural and social contexts of heritage sites, as well as their environmental and economic dimensions. This approach should include adaptive management strategies that allow for ongoing adjustments and modifications as climate conditions change over time, and meaningful engagement with local communities and stakeholders to ensure that their perspectives and knowledge are integrated into conservation planning and decision-making.

Bottom-up approaches to regional heritage landscape planning and management face challenges that must be addressed to be effective. Limited resources, power imbalances, lack of consensus, short-term focus, and resistance to change are some of the key challenges. Local communities may

lack the financial and technical resources required to manage and preserve their cultural landscapes, which may require support from external actors. Power imbalances between stakeholders, particularly marginalized groups, can limit the effectiveness of bottom-up approaches. Local communities may have diverse perspectives and interests that make it challenging to reach a consensus on management strategies. They may prioritize short-term economic benefits over long-term cultural and environmental preservation. Traditional practices and cultural values may be resistant to change, making it difficult to implement new management strategies or adapt to changing environmental conditions. In summary, careful consideration and strategies are necessary to overcome these challenges and ensure the effective implementation of bottom-up approaches to regional heritage landscape planning and management.

In order to mitigate the effects of climate change on cultural landscapes, there is a need to link cultural landscape development and management to resilience. This can be achieved through the integration of local community participation, interdisciplinary landscape planning, investment in local learning and networking, and measurement tools for climate adaptation progress. However, there are challenges in terms of limited funding, inadequate public awareness, and potential conflicts among stakeholders that must be addressed. Additionally, there are scientific obstacles that need to be overcome and research gaps that must be filled to better understand the implications of climate change on conservation practices and to develop effective strategies to build resilience in cultural landscapes.

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