

Postface

Climatic and Ecological Change in the Americas: A Perspective from Historical Ecology

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Introduction

Global environmental change, including changes in the functioning of the atmospheric and the biophysical systems, is a phenomenon affecting all ecosystems and societies around the world. Nevertheless, the way in which atmospheric and environmental changes impact each ecosystem and each society are distinctively different, being shaped both by the specific biophysical environment in which they occur (IPCC 2022) and also by the socio-cultural and historical contexts that form societies as we know them today (Adger et al. 2013; Crate 2011; de Souza et al. 2019). Since historical ecology recognizes at its core both the place-specific interactions between landscapes and people and the large-scale and long-term processes that shape local contexts in unique ways (Balée 1998; Dayton et al. 1998; Odone and Molino 2021; Crumley 2017; Balée and Erickson 2006; Crumley, Westin, and Lennartsson 2017), this approach provides a well-suited theoretical and methodological framework for understanding how long-term patterns and current processes of change interact in their impacts on specific social–ecological systems.

This book examines different climate change experiences across the Americas using historical ecology as a structuring framework for understanding climatic and environmental change across space and through time. Overall, the contributions presented add to current scholarship in historical ecology in the context of climatic and ecological change by significantly advancing three emerging topics: (1) the intertwined character of climatic and environmental change impacts; (2) the importance of values, ontologies, and governance systems to explain beneficial impacts of long term landscape management; and (3) the importance of engaged research. In this postface, we elaborate on how chapters in this book advance these important emerging topics.

Climate Change and Environmental Change are Intertwined and Their Impacts are Situated in Specific Socio-Cultural Contexts

One of the first important emerging topics that permeates several chapters in this volume is the idea that climate change and environmental change are intertwined and situated in specific socio-cultural contexts. Hence, the way such changes impact people and people's responses to them cannot be understood without considering these connections and contexts. Indeed, since the 1970s, several scholars have focused on ancient climatic oscillations as a factor affecting landscapes and cultures (e.g., Meggers 1979). However, scientists increasingly recognize that – because ecological and anthropogenic forces have long interacted in complex ways – climate change impacts should be considered in the ecological and cultural context in which they occur (e.g., Hans-Otto Pörtner et al. 2021). In other words, current scholarship is increasingly embracing the idea that, while climate change is a global phenomenon, it is expressed and experienced at a local scale, which requires considering the synergistic effects between climate change and other direct and indirect drivers of environmental change (e.g., land use change and pollution), as well as the social context in which climate change operates (e.g., colonial history, differences in access and control of resources, presence of development and extractive projects) (e.g., Junqueira et al. 2021; de Souza et al. 2019).

Drawing on theoretical praxes and postulates of historical ecology, which reject environmental determinism and emphasize historical contexts (Balée 2006), several chapters in this volume emphasize the importance of looking at the climate–biodiversity–society nexus to understand the complex network that results in climatic and ecological change in the Americas. For example, in Chapter 1, Rostain and de Souza argue that the drier period accompanying the Medieval Climatic Anomaly (950–700 BP) most likely affected demographic and settlement patterns in Amazonian populations. Importantly, while some cultures flourished, others collapsed or moved to nearby locations, suggesting that responses to climate change impacts were highly culture-specific (see also de Souza et al. 2019). In Chapter 2, Ford argues that climatic changes (particularly an overall drying trend) in the Maya region (beginning 4,000 years ago) coincide with the emergence of permanent settlements and with an increase in landscape management, leading to substantial changes in forest composition. In Chapter 4, Mueller shows how Indigenous peoples in eastern North America prevented ecological changes associated with climatic impacts and preserved prairies and pyrophytic forests through ecological management that mimicked past climate conditions. Similarly, in discussing the importance of fire as a key component of dry conifer forests in western North America, Roos and colleagues argue in Chapter 5 that Indigenous fire management strategies (involving small, frequent patch burning) fundamentally increased forest fire resilience (see also Coop et al. 2020; Savage and Mast 2005), which again shows how

climate change impacts on ecosystems can be palliated through social and cultural practices, such as long term landscape management.

The climate–biodiversity–society nexus is equally emphasized in chapters looking at current climatic and ecological impacts. An important argument being made in several chapters in this book is that these impacts are particularly exacerbated in communities where long-term histories of excessive resource extraction coupled with colonial legacies and recent development pressures (such as land-use change) have increased vulnerability. In that sense, Rostain and de Souza in Chapter 1 state that “*climate change is not the first danger to the Amerindians. [. . .] Western socio-technological change is by far the most dangerous threat.*” In a similar vein, Ladio and dos Reis in Chapter 6 argue that current threats to the conservation of *Araucaria araucana*, a species of key cultural and economic importance to the Pewenche and other Indigenous groups in Argentina and Chile, increases their situation of vulnerability. In Chapter 10, Jean-Jacques and colleagues analyze how current coastal landscape and settlement patterns of Kali’na Indigenous peoples in the Maroni River result from both historical and contemporary social–ecological processes, including contexts of colonization and the intrinsic river mobility and environmental responses of local populations. In Chapter 12, Whitaker shows how Indigenous communities understand flooding, drought, and related climatic phenomena through ontological frameworks and within contexts of past and present colonization and marginalization.

Values, Ontologies, and Governance Systems Explain Beneficial Impacts of Historical Forms of Landscape Management

A signature contribution of the historical ecology framework is that, over millennia, societies have transformed (or “domesticated”) their landscapes to obtain beneficial social impacts, or to increase the contributions that nature provides to people (Crumley 2017; Rostain 2010; Graham 2006; Clement 1999). Some well-known examples of these long-term modifications resulting in landscapes that are more “productive and congenial for humans” (Clement 1999) include earthworks such as raised fields or forest islands (Rostain 2010; Lombardo et al. 2020; de Souza et al. 2019), fish weirs (Blatrix et al. 2018), anthropogenic forests with concentrations of useful and domesticated species (Maezumi et al. 2018; Levis et al. 2017; Armstrong 2021), landscape-scale water, forest, and fire management (Lentz, Dunning, and Scarborough 2015; Anderson 2005), or the creation of anthropogenic soils (Iriarte et al. 2020). Several of the chapters in this volume continue this line of thinking. For example, three chapters of this book discuss how Indigenous peoples have manipulated landscapes (e.g., by preserving prairies and pyrophytic forests) to improve fire resilience and thus reduce severe risks from wildfires. Together, the chapters herein by Rick and colleagues, Mueller, and Roos and colleagues show how landscapes “domesticated” through the skillful use of fire not only reduced risks from severe wildfires, but also supported plants

and animals that could help in meeting the challenges of severe droughts. In a similar line, in Chapter 8, Lepofsky and Salomon provide another example of how – amidst climatic and ecological changes spanning millennia – Indigenous peoples in coastal British Columbia, Canada, constructed and managed intertidal rock-walled terraces to favor clam growth, thus providing a strong basis for local economies.

However, while postulates for historical–ecological research suggest that all ecosystems on Earth might have been, to some degree, affected by human societies, they also emphasize that there is no “pre-programmed” direction regarding whether landscape manipulations would result in beneficial or detrimental impacts in species diversity or other environmental parameters (Balée 2006). So, the question remains: What are the underlying conditions that allow landscape manipulations to result in long-term, simultaneous, and beneficial social and ecological impacts? In response to that question, an important emerging topic that permeates several chapters in this volume is the critical role that values, ontologies, and governance have in understanding impacts generated by historical forms of landscape management.

In that sense, several of the works presented in this volume go beyond descriptions of landscape management practices and propose relational frameworks that emphasize how values, ontologies, and governance systems underpinning historical landscape management strategies mediate the sustainability and resilience of social–ecological systems. For example, Rostain and Souza in Chapter 1 emphasize that Native people of the Northwest Amazon associate climate change with human activities, acknowledging also their own role in driving the observed changes. In a similar vein, in Chapter 2, Ford emphasizes that the limited understanding of forest value brought by Spanish conquerors undermined the Maya flexible and resilient strategies and practices of forest management, ultimately affecting ecosystem resilience as a whole. In Chapter 6, Ladio and dos Reis use the concept of “relational models” to analyze the spatio-temporal pattern of the Pewen landscape use in Argentina and Chile. Their framework analyzes the preferences, principles, and virtues that explain the degree of responsibility towards non-human beings developed by different cultural groups interacting with the forest. The authors show that, against the extractive model of colonizing societies, the mutual nurturing model developed by Pewenche communities builds resilience in contexts of socio-environmental change, demonstrating the importance of Indigenous cosmologies and governance systems in forest conservation. With a focus on local ontologies, in Chapter 12, Whitaker highlights how understandings of weather phenomena among the Makushi and Akawaio people in Guyana often center around notions of ownership in the historical–ecological landscape, which implicate non-human beings. The author makes the argument that for these Indigenous groups, climate change is understood as part of ongoing relations between humans and non-humans (particularly “owner” or “master” beings) who dwell within the “cultural forest” and broader landscape. These interactions involve back-and-forth

exchanges and relational management, for which contemporary climatic and weather-related disturbances are understood to occur due to breakages in normative relations with non-human entities.

Overall, these contributions bring to light the localized community histories, customary laws, cosmologies, and governance structures that explain long-term landscape management beyond its technical and biophysical aspects. The approach is important because it honors place-based knowledge, identities, and histories as they have developed over generations and as they are reflected in local governance protocols, laws, religious practices, and other cultural constructs (Trosper 2011; Turner 2014; Anderson 2005). The approach also emphasizes how intangible elements underpin observable landscape management and are inseparable from landscape material features (whether those are ecological parameters or infrastructure development) (see Nadasdy 2005; Johnson 2010 for a similar argument).

Importantly, by advancing this emerging topic, this book contributes to the move of historical ecology research away from the positivist standpoint that (by conceptualizing humans as mere ecosystem managers) separates them from nature. In a way, this new development responds to a recent call to “*consider how various ontological perspectives and worldviews can confront the dominant and controlling nature of human relationships to the environment – the same dominant relationship that is espoused by ‘technofixers’ as the answer to climate change*” (Armstrong and Junqueira 2020). Notably, the emphasis on how intangible elements underpin and are inseparable from observable landscape management is much in line with the latest IPCC assessment report (IPCC 2022) and with the IPBES conceptual framework (Díaz et al. 2015), both of which have suggested that technological fixes are insufficient to deal with the current climatic and environmental crises, and that we need a larger focus on changing values, preferences, and the ways through which we relate to non-humans. Implicit in this way of thinking is that attempts to look to the past to guide the future of resilient and equitable landscapes amid changing social–ecological conditions should go beyond the study of material features and dig into the relational logics (including worldviews, ontologies, values, and governance systems) that put those landscape management systems in place.

A Call for Engaged Research

A final important topic emerging from chapters in this book relates to the importance of engaged research, particularly attending to current demands of Indigenous peoples and local communities to be able to continue managing the landscapes and territories they have traditionally managed. Applied work is not new in historical ecology (e.g., Swetnam, Allen, and Betancourt 1999). Indeed, a hallmark of historical ecology is the diversity of methods and knowledge systems used to better understand the past, evaluate present conditions, and inform future decisions (e.g., Pauly 1995; Egan and Howell

2001). By focusing on people's historical relations with landscapes, scholars working with the approach of historical ecology have done more than broaden research engagements with peoples' responses to climatic and ecological vulnerabilities; they have also often engaged with changing landscapes and with applications of Indigenous and local knowledge (Crumley 2017).

Nevertheless, different authors adopt different approaches in applying knowledge derived from historical ecology research. Some authors adopt a pragmatic approach. For example, in Chapter 5, after demonstrating that Native American fire management favored ecosystem resilience in Southern USA, Roos and colleagues suggest that similar strategies could be applied today to reduce the risk of future high-severity fires (see also Lake et al. 2017). Similarly, in Chapter 9, Rivera-Collazo explores food and habitat security during times of environmental change in the ancient Caribbean (between c. 2000BC–1500AD) and discusses ways in which past responses to various environmental crises (e.g., hurricanes, floods, sea level rise, and ocean warming) can inform current climate mitigation strategies. Overall, this pragmatic approach explores how lessons learned from historical ecology research can be useful as inspirations for improving resource management systems and addressing the current environmental crises.

Other authors emphasize how unveiling long-term sustainable landscape management through historical ecology research constitutes an empirical basis to support local communities' demands for territorial and/or other stewardship rights. For example, in Chapter 3, after analyzing North Coastal Indigenous communities' land management in California, including traditional burning practices and fisheries and wildlife conservation efforts, Rick and colleagues argue that colonialism exacerbated climate impacts, as colonial policies displaced people from their ancestral lands, denied them access to coastal and other resources, and caused major upheavals, resulting in a dramatic reorganization of California's ecosystems. Based on these findings, the authors call for the restoration of Indigenous connections to their ancestral land and seascapes as a way to restore functioning ecosystems. In that way, authors in this chapter use findings from historical ecology research to support the claims of descendant communities seeking to assert resource title and sovereignty to reclaim land-based livelihoods. Similarly, the integrated historical–ecological perspective presented by Armstrong and colleagues in Chapter 7 shows how historical Indigenous stewardship and management of their homelands created beneficial ecological legacies on the Northwest Coast of Canada. According to the authors, such a long-term perspective allows identifying the contribution of different societies to environmental degradation and/or regeneration, which might be useful in the development of just climate change mitigation strategies. Similarly, in Chapter 8, Lepofsky and Salomon show how the interplay between social and environmental variables across time and space has shaped practices related to the building, maintenance, and use of intertidal rock-walled terraces to favor the growth of clams. Here, according to the authors, the

assessment of such long-term practices constitutes an important basis for the reconnection to and reclamation of ancestral clam gardens by current Indigenous populations.

All in all, these chapters indicate a contemporary tendency of applied historical ecology to learn from the past and apply this knowledge not only to improving ecosystem management, but also to restoring the rights of communities to the landscapes they have historically managed.

Conclusion

In its relatively short life as an academic multidisciplinary framework, historical ecology has contributed to showing several ways in which landscape management can result in beneficial effects to societies. This book adds to this body of research in three main ways. First, chapters in this volume emphasize the many ways in which climate change and environmental change are intertwined and how their impacts are situated in specific socio-cultural contexts. This implies that attempts to understand historical processes of change and how they impact current social–ecological systems need to consider the climate–biodiversity–society nexus. Second, because landscape management occurs in specific socio-cultural contexts, attempts to inform the future also need to consider the values, ontologies, and governance systems that underpinned specific management techniques. Third, several chapters in this volume demonstrate how historical ecology research can engage with the demands, claims, and understandings of landscape stewards, thus contributing to maintaining or restoring functioning social–ecological systems. In sum, as we learn from this volume, future works in historical ecology should systematically consider the broader social contexts in which landscape management took place and – where appropriated – consider how research results can support the rights of the populations that have domesticated landscapes to maintain their ecological functioning while providing beneficial impacts to societies.

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