Lessons for Modern Environmental and Climate Policy from Iron Age South Central Africa

Kathryn de Luna, Matthew Pawlowicz, and Jeffery Fleisher

Abstract How do we develop effective environmental and climate policy for regions of the world with few—if any—relevant paleoclimate, vegetation, and hydrological reconstructions and, therefore, impoverished models of the environmental and human impacts of future climate change? What if such regions are in countries with limited financial, institutional, or instrumental infrastructure to generate those records? Research in historical disciplines offer direct and indirect evidence of the relationships between societal change and past environmental and climate change, without resorting to bald instrumentalism, but, as this study shows, we need to broaden our historical toolkit if we are to develop such work in regions of the world where oral cultures and less monumental, less permanent material cultural traditions prevailed.

Keywords Southern Africa · Paleoclimate · Environmental History · Policy · Climate Change · Zambia · Archaeology · Historical Linguistics

Introduction

How do we develop effective environmental and climate policy for regions of the world with few—if any—relevant paleoclimate, vegetation, and hydrological reconstructions and, therefore, impoverished models of the environmental and human impacts of future climate change? How is the task made more complex when such poorly documented regions are also in countries with limited financial, institutional, or instrumental infrastructure to generate those records?

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In many areas that have seen little or no field research by scholars in the natural sciences, research in historical disciplines—notably historical linguistics and archaeology (including subspecialties like geoarchaeology and archaeobotany)—offer direct and indirect evidence of the relationships between societal change and past environmental and climate change (on the emerging preinstrumental climate of Africa, see Hachigonta and Reason 2006; Giannini et al. 2008; Tierney et al. 2010, 2013; Anchukaitis and Tierney 2013; Sletten et al. 2013; Nash et al. 2016; Voarintsoa et al. 2017; Lüning et al. 2018). There are distinct advantages to these historical archives compared to the paper, vellum, and papyrus archives of human–environment and human-climate interactions in the past used by most historians. Significantly, historical linguistics and archaeology generate historical data on geographical and temporal scales commensurate with (1) the larger geographical and temporal scales of most natural scientists' evidence of past climate and environmental change; (2) the vast scales on which most models of future climate change work; and (3) the national and regional scales on which policy must function for effective interventions in the future. The large chronological spans inherent to historical linguistic and archaeological data allow for long-term analysis of human-environmental interaction, but, leveraged against one another, they also connect the hyperlocal focus of archaeological excavation up through the regional and even continental geographies of language change, much as a speleothem or ice core sampled from a specific site can be connected to the expansive scales of shifts in global atmospheric circulations. Thus, historical linguistics and archaeology serve as key direct and indirect archives of past human–environment interactions, strategies, and outcomes at scales relevant to those governing policy-making. They also offer a way to recover past environmental constraints that may be beyond the ken of living memory or documented conditions. Finally, these archives offer indirect proxies of past periods of environmental change, with implications for identifying periods and places most in need of natural science research.

This article explores a case study grounded in historical linguistic and archaeological data in order to explore past societies' strategies of adaptation to changing hydroclimatic conditions in south central Africa over the last 1500 years. It opens with a description of the region and an introduction to the methods of historical linguistics, which are likely to be less familiar to readers than the methods of archaeology. The chapter then moves into the case study, exploring changing practices of mobility, subsistence, and trade across fifteen centuries and several climate fluctuations. Finally, the chapter returns to the implications of both this specific history for policy in south central Africa, but also these methods for the body of evidence mustered in service of producing effective policy, particularly around climate change.

Background

This study focuses on south central Africa—more specifically the region inhabited today by speakers of a broad language family called 'Botatwe.' Today, speakers of

Botatwe languages reside primarily in central, southern, and western provinces of Zambia, with some speakers also residing in lands to the south of the Zambezi River, in northern Zimbabwe, northern Botswana, and the northeastern Caprivi Strip of Namibia (Fig. 1). Generally, the vegetation of this region is characterized as wooded savanna. In the northern regions of Botatwe settlement, the dominant vegetation is miombo, while it is mopane in the south, closer to the Zambezi River. Within these two broad forms of wooded savanna, anthills, ledges and rock outcroppings, perennial rivers, annual streams, seasonally flooded marshes (dambos), and larger floodplains create a variety of microenvironments. The region is characterized by a rainy season (November–April), a cool, dry winter (May–August), and hot, dry summer (September–November).

Today, most rural inhabitants are subsistence farmers, often mixing maize and other cereal crops with fowl, small stock (particularly goats), and some cattle. Currently, the isohyetal lines marking the limits of rainfed agriculture fall south of the region, but in the past, the movement of these limits changed with the extent of the migration of the Intertropical Convergence Zone, leading to variability in the characteristics of seasonality over time (Vansina 2004; de Luna 2016). The region sits at the intersection of the low-level moisture circuits of both the Atlantic and Indian Oceans, which are affected by the 'Angolan Low' low-pressure system and the 'Benguela Niña/Niño' events (Reason et al. 2006). This seasonal weather unfolds in the context of wider climate shifts relating to ENSO phases and the Indian Ocean Dipole, particularly in southern Zambia (Rouault 2003; Hachigonta and Reason 2006; Hurrell et al. 2006; Hardesty 2007; Plisnier et al. 2008) In this way, the region

Fig. 1 Location of extant Botatwe Languages c. 1900

sits at a cross-roads of several systems affecting the quality of the rainy season and, thereby, cereal harvests. While farmers were usually able to harvest cereals, the size and quality of harvests shifted with changing climate conditions, particularly in the marginal, drier southern areas (those now characterized by mopane wooded savanna vegetation). The limited organic materials in soils require a swidden agricultural regime that is increasingly difficult to sustain in the face of modern land tenure regimes and changing opportunities for and ideas about mobility (e.g. Cliggett 2005), thereby compounding the vulnerability of rural farmers to hydroclimatic shifts (Jain 2006; Riché 2007).

Current models predict decreasing rainfall and increased storminess with more erratic rainfall when precipitation does occur (Hulme et al. 2001; Giannini et al. 2008; Kay and Washington 2008; Shongwe et al. 2009; McSweeney et al. 2010; Christensen et al. 2013). Models of the future impact of global climate change are usually rooted in paleoclimate reconstructions based on paleoclimate proxies, few of which exist in Zambia or the wider region. This dearth of paleoclimate proxies confounds our ability to understand the vulnerability of different populations in the region, revealing the need for indirect evidence of past human–environment interaction in the context of hydroclimate variability in this region. The case study in this chapter and the wider ongoing project from which it stems seeks to address this problem.

An Introduction to Historical Linguistics

Languages change over time as the lives of their communities of speakers change (Crowley and Bowern 2010; Dimmendaal 2011; Ehret 2011). Speakers invent their own new words or adopt new words from other languages to name novel (usually borrowed) technologies, practices, or ideas. Speakers' pronunciations shift, taking on regional forms through 'natural' processes like lenition or under the influence of speakers of other near-by languages. Indeed, changes occur across all language features—grammar, syntax, semantics, and so on—accumulating slowly over time in a process that eventually renders a form of speaking a 'language' in one place unintelligible from the way the same language is eventually spoken in another region. In the premodern past, such changes were often the result of the movement of speakers of a language into new regions or the adoption of the language into new regions by the people living in that area. In other words, over long periods of time—centuries or millennia—languages diverge or dissolve into new languages, much like Latin's parentage of French, Romanian, Italian, Spanish, and Portuguese (as well as many further extant and lost dialects). Dissolution is always related to human dynamics, whether the small scale incremental movements of swidden farmers or large-scale imperial expansion (such as the rapid expansion of Quechuan languages at the expense of Aymaran languages in the context of the expansion Inca rule in the Andes; Heggarty and Beresford-Jones 2010).

The fact that languages (or ancestral languages, protolanguages) diverge over time in part through changes in vocabulary offers an historical framework for reconstructing the past worlds and experiences of societies who left no written record and for regions where there has been little to no archaeology. This method assumes that words are historical artifacts attesting to the existence of the idea or object to which they refer. Briefly, a word's phonological shape and distribution in extant languages determines its place in particular "branches" of a language family tree (Fig. 1). Languages undergo predictable sound changes—a point not lost on anyone who speaks more than one language in a family of languages—which are identified through the comparative study of sound correspondences in cognate words across languages (and historical documents). Consider, for example, Grimm's law. Simplified, Proto-Indo-European initial consonant *p was conserved in Romance languages but shifted in a process called lenition to an /f/ in Germanic languages in the position at the beginning of a word stem (for example, consider French and German cognates to father, foot, fish). Thus, a word's phonological shape and distribution within a branch of a language family can also tell us which of three historical processes is responsible for its presence in one or more "generations" (protolanguages) of that the language family: inheritance, internal innovation, or borrowing from other languages. A historical linguist determines when within a language family's history a word was produced and by what process.

Reconstructions of past climate and environment from the archives of the natural sciences are absent from the Botatwe-language speaking areas of south central Africa on which this chapter focuses (Fig. 1). A recent climate reconstruction for the region's Iron Age seeks to reconcile the disparate—and dispersed—records (lake and speleothem records) available beyond the Botatwe zone (Degroot et al. 2021, esp. Fig. 6) in order to track patterns of wetter/warmer and drier/cooler conditions. This synthesis identifies a period of wetter, warmer conditions at the turn of the millennium, with two peaks—the first in the eighth or ninth century and a possible second spike in the thirteen or fourteenth century. These peaks of wetter, warmer weather in the region correspond in stunning fashion to key periods of linguistic diversification independently dated through both glottochronology and robust direct associations with the archaeological record (de Luna 2012a, 2016; Pawlowicz et al. 2018; de Luna and Fleisher 2019). More specifically, the synchronicity of regional climate shifts and language change in the form of the divergences of Central Eastern Botatwe around the mid-eighth century and, later, Kafue around the mid-thirteenth century (Fig. 2) raise questions about the relationships between these two historical processes and the possibility that language data—particularly in conjunction with archaeology—might yield insights into past human–environment relationships in the context of climatic change.

Proto-Botatwe (57–71% [100–900]; 64% median [500]).

I. **Greater Eastern Botatwe** (63–74% [500–1000]; 68.5% median [750])

   a. **Central Eastern Botatwe** (70–77% [800–1100]; 73/5% median [950]
      i. **Kafue** (78–81% [1200–1300]; 79.5% median [1250])

Outline Classification of Botatwe Languages (de Luna 2010, 2016)
(cognation rates, cognation medians, and Common Era dates of divergence in parentheses; proto-languages in **bold**, extant languages underlined)

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- a. **Central Eastern Botatwe** (70-77% [800-1100]; 73/5% median [950]
  - i. **Kafue** (78-81% [1200-1300]; 79.5% median [1250])
    1. Ila
    2. Tonga
    3. Sala
    4. Lenje
  - ii. **Falls** (91% [1700])
    1. Toka
    2. Leya
  - iii. Lundwe
- b. Soli

II. **Western Botatwe** (76-81% [1100-1300]; 78.5% median [1200])
- a. **Zambezi Hook** (83% [1400])
  - i. Shanjo
  - ii. Fwe
- b. **Machili** (84-58% [1400-1450]; 84.5% median [1425])
  - i. Mbalangwe
  - ii. Subiya
  - iii. Totela

Fig. 2 Outline Classification of Botatwe Languages (de Luna 2010, 2016) (cognation rates, cognation medians, and Common Era dates of divergence in parentheses; proto-languages in **bold**, extant languages underlined)

1. *Ila*
2. *Tonga*
3. *Sala*
4. *Lenje*

ii. **Falls** (91% [1700])

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Both linguistic and archaeological data attest to the significance of population movement in the linguistic divergences of Botatwe protolangauges during this period,

highlighting the value of these forms of historical evidence for not only firming up 'cautious inferences' from wider regional records in the reconstruction of past climate but also the foundations for societal resilience. Evidence of human mobility related to climate change is implied in the synchronicity of the chronologies of climate and language change; population movement was a key driver of linguistic differentiation and divergence in the premodern world. Linguistic evidence teaches us that from the last quarter of the first millennium through the first quarter of the second millennium, speakers of eastern Botatwe languages spread from the predictably moist floodplains of the Kafue River to regions to the north and south of that floodplain as landscapes that had been marginal to settlement grew more attractive with increased rainfall extending the limits of rain-fed agriculture. This process was mirrored in western Botatwe language groups in the same period—and into more marginal lands (de Luna 2016; consider similar processes in Vansina 2004). Each of the trajectories of expansion involved movement into territories with substantial rivers and wetlands: the Lukanga and Busanga swamps to the east and west of the floodplain, respectively, and the Kalomo, Machili, Lunsemfwa, and Zambezi Rivers, among many smaller annual and perennial streams. These expansions, and the cultural similarities across space they engendered, are reflected in the similarities between ceramics recovered from sites across the area during this time period. The ceramics from the Kafue floodplain, most frequently closed-mouth, spherical vessels with bands of comb-stamping or incised decorations just below the rim (Fagan 1967, Fagan et al. 1969; Derricourt 1985; Pawlowicz et al. 2018), bear similarities to those found on the Batoka Plateau (Fagan 1967, Fagan et al. 1969; Huffman 1989), as well as the upper Zambezi valley (Vogel 1971). Both linguistic and archaeological evidence demonstrate that the expansion of Botatwe speaking communities occurred at the expense of preexisting populations, which were displaced or absorbed. This way, the Botatwe case study serves as an example of resilience and successful, strategic engagements with changing environmental and hydroclimatological conditions.

Thus, the linguistic, archaeological, and climatic chronologies are synchronous even as the linguistic and archaeological evidence attest to the significance of mobility in societies' abilities to engage changing environmental conditions. The centrality of mobility to societal resilience has implications for the sorts of sweeping policies that will be needed to mitigate the threats of future climate change in the region—whether those changes yield wetter or drier conditions or simply increasing unpredictability, as was the case in the west African Sahel (McIntosh 1993, 2005; McIntosh et al. 2000; Maley and Vernet 2015) and is expected to be the case in south central Africa. The specific reasons mobility featured as such an important strategy are essential to our understanding of how the environment changed in the past in the face of shifting hydroclimatic conditions. The words invented by speakers of past languages and the materials they crafted to live successfully in their world offer insights into the causes and consequences of mobility as a strategy of resilience.

The historical development of vocabulary for features of the environment or climate serves as an indirect proxy of changing conditions. The historical development of vocabulary naming changes in a society's actions and practices taken in

and on the environment are even less direct as a body of evidence of changing conditions, but they are significant as evidence of strategies for engaging environmental change in the context of hydroclimatic shifts. The centuries around the turn of the first millennium coincided with a transformation of subsistence technologies as reflected in the invention of lexicons naming new subsistence techniques and technologies and the faunal remains recovered from regional sites (de Luna 2016; Pawlowicz et al. 2018; de Luna and Fleisher 2019). Counter-intuitively, an earlier first millennium shift to cereal agriculture sustained great innovation in farmers' hunting and fishing practices during the centuries before and after the turn of the millennium. Importantly, new vocabulary named forms of fishing undertaken in receding floodwaters and with spears thrown from canoes in rapid currents of more swiftly moving rivers. These linguistic innovations were matched by abundant catfish remains from settlements along the Middle Kafue, for example (Fagan 1978; Pawlowicz et al. 2018). Within the domain of hunting, new lexicons named a novel social status of 'celebrated hunter' and forms of hunting based around spearcraft (demonstrating overlap in the technologies of hunting and fishing; de Luna 2012b, 2016). The social scale of hunting scaled up as larger communities worked together using fire and human beaters in large-scale game drives, particularly targeting waterbuck (de Luna 2016). This shift in the Botatwe speaking region was contemporaneous with the emergence of differentiated food consumption habits—some focused on waterbuck—in regions to the south, including the Kalahari and eastern Botswana savannas (Denbow et al. 2008).

The social aspirations fulfilled by those with access to game and fish were gendered in ways that shaped the experiences of plenty, precarity, and dependency in local communities. Yet, the overall political structure of communities remained persistently decentralized, even under pressure from communities experimenting with political centralization and social stratification on the fringes of Botatwe-speaking communities (de Luna 2016). Indeed, the ephemeral—even seasonal—nature of the influence of high-status hunters and fishers—of a politics of reputation and fame that emerged with new hunting and fishing technologies—likely contributed to the persistence of the long-standing durable, flexible political culture structuring the way local communities responded to hydroclimatic anomalies. By diversifying the realms of work and wealth privileged as socially and economically valuable, Botatwe speaking communities ensured that control of agriculture did not, in fact, follow in lock-step with power and extreme social differentiation, as they did in other parts of the medieval world. As a result, vulnerability was more dispersed at the household level, if not at the level of the individual due to the gendered access to food, fame, and wealth.

There was a significant change in the nature of Botatwe speakers' participation in central African trade networks around the thirteenth century, overlapping with the possible second spike of warmer/wetter conditions in the climate records. Prior to that point, the beads acquired by communities in the middle Kafue were made of ostrich and other shell, and some were produced locally (Pawlowicz et al. 2018). By the end of the thirteenth century, these have been replaced by copper bangles and glass beads, the latter likely part of the Mapungubwe oblate series known from

South African materials (Wood 2011). The beginnings of this shift might be marked by the presence of a single, exceptional glass bead of the K2 Garden Roller series at Miyoba (Pawlowicz et al. 2018). That bead, the only such bead found in a stratified context north of the Zambezi, was likely made at K2 in South Africa or a related site in the twelfth century. This shift also captures the broader expansion of trade networks at the time, stretching between the Upemba Depression and the Zimbabwe Plateau and increasingly linked with Indian Ocean commerce (Denbow et al. 2015; Stephens et al. 2020). These shifts in trade and subsistence were undoubtedly related (as individuated by the loanwords describing such activities; de Luna 2012b, 2016) and both contributed to the maintenance of decentralized political power, as was also the case in the unpredictable climate and articulated subsistence mosaic that emerged in the Inland Niger Delta region of west Africa several centuries earlier (McIntosh 1993, 2005).

Mobility was the lynchpin in Botatwe strategies of resiliency in the warmer, wetter conditions of the centuries around the turn of the millennium—particularly to weathering the spikes of moisture that would have transformed seasonal flood patterns as well as the relationship between the characteristics of rain and the varietals of millet and sorghum planted. Mobility was essential to the work of hunters and fishers as they worked during seasonal lulls in the agricultural calendar, often traveling to distant hunting and fishing grounds, perhaps to reunite with clan members and extended family (de Luna 2016). It was a determining factor in the location of settlements in the Middle Kafue. Both settlement mounds and more ephemeral sites were preferentially located at a transition zone between grasslands of the floodplain and higher elevation woodlands. This pattern also existed in the twentieth century, presumably for the same reason: to ensure access to subsistence resources in each environmental zone (Derricourt 1985). Striking a balance between avoiding the flood during the wet and accessing waterways during the dry was surely another consideration. But mobility featured in more sustained ways than these daily or weekly traverses. The archaeological and linguistic data also demonstrate that packing up house and moving to new territories was a key strategy during this period.

Comparison of medieval strategies to later strategies implicated in responses to the cooler and drier conditions centuries later remind us that the nature of climate change—warmer/wetter or cooler/drier—did not determine societal response. Some of the paleoclimate reconstructions discussed for the wider region of central and southern Africa (Degroot et al. 2021) register a shift to drier, cooler conditions in the second half of the seventeenth century. Once again, this corresponds to the last period of linguistic divergence in the Botatwe language family as the Falls protolanguage diverged into Toka and Leya, now spoken around Livingstone in southern Zambia. This divergence during drier, cooler conditions supports the idea that mobility underlay strategies to accommodate all forms of hydroclimatic anomalies—not just periods of increased moisture and temperature. These movements south, toward the Zambezi River may also have related to the extension and intensification of trade networks south the river—networks that ultimately linked to the Indian Ocean and to Europe. Recent work on the Little Ice Age in Europe draws out trade—particularly long-distance trade—as one resilient adaptation to the effects of

climate anomalies within the Dutch context (Degroot 2018). It may be that such strategies were repeatedly used by distinct societies in different historical contexts. After all, speakers of the Central Eastern Botatwe and Kafue protolanguages similarly reconfigured their trade networks, facilitating the population movement and linguistic divergence corresponding to the pulses of warmer, wetter climate, discussed above. The borrowing of non-Botatwe vocabulary for fishing and hunting techniques during this period supplies the proof that such activities connected Botatwe speaking and non-Botatwe speaking communities, often across great distances, revealing the intersection of subsistence and interregional trade.

The amplification of trade as a strategy to mitigate the threats of climate change to men and women's access to status, wealth, or even simply their definition of well-being connected very distant communities. Falls speakers' strategies were indirectly connected through Indian Ocean networks as certainly as they were directly connected to developments in the copper mines south of the Zambezi River or the trading hub downriver at Ingombe Ilede (summarized in de Luna 2016). These historical examples offer stark reminders of the extraordinary, rippled geographies of interlocking, articulated responses to environmental and climate change that we should anticipate as we plan our policies to address human-induced climate change and its unequal impacts. They should also remind us that many of the most resilient strategies—resilience here demonstrated by the fact that Botatwe speaking communities absorbed or pushed out neighbors with other languages, material cultures, and lifeways—are coupled together, as we see with developments in mobility, trade, and subsistence with the Botatwe story. Indeed, it may be instructive to remember that the conceptual distinction between 'subsistence' and 'trade' was an invention of European moral philosopher's ruminations on political economy during the seventeenth and eighteenth centuries, inviting our reflection on the many ways societies' ideas about wealth, political influence, and well-being intersected with reconfigurations of political economies during periods of climate change (de Luna 2016).

Forgotten Strategies for Future Policy

Established histories and ongoing research tracking adaptation and change in the face of climate and environmental change over the last millennia and a half in south central Africa opens a number of pressing questions for policy makers working on issues of resilience and equity on the continent.

Mobility. This is not the first study to point to the significance of mobility and the capacity to negotiate access to land and other resources (like game, fish, and salt) as a mechanism for addressing climate and environmental change. Anthropologists and archaeologists in West Africa have shown in great detail how the climatic variation characterized foremost by instability can create the conditions for complex systems with subsistence specializations (farming, herding, fishing, hunting) that are integrated through mobility and exchange (Park 1992; McIntosh 2005). As places

that connect diverse and seasonally active environments, floodplains offer unique contexts for such complex systems. Case studies in the Inland Niger Delta, the Middle Senegal Valley (McIntosh 1999), and the Kafue floodplain and wetlands of south central Africa demonstrate the way that such diverse and integrated subsistence systems can be forces for resilience in the face of climate instability. One of the challenges of pressing such historical models into service for contemporary policy, however, is that these systems also rely on highly decentralized decision-making structures, with key connections distributed *across* the system rather than concentrated in nodes of authority and power. Such studies remind us that the invention of private property and the nation state model of governance has come at a price of increasing environmental vulnerability for many societies; the history of land reform at the national level teaches us that large-scale structural change in land access in Africa is not impossible, though, to date, such policies have largely benefitted those in power.

New Currencies and Social Values Diffusing Political Influence. Historical case studies from 'premodern' contexts also bring into stark relief the importance of wider conversations about capitalism, wealth, and well-being. Stories like the Botatwe case in which new climate regimes also created new opportunities for wealth accumulation are hardly surprising reminders that there will be a redistribution of wealth with future climate change. But, the Botatwe story also highlights the way that the development of new, non-material 'currencies' reflecting changing societal values (hunter's fame, for example) are essential for the success of any form of resilience in the face of climate-driven environmental change, particularly if the policy goals include a more equitable, ephemeral/seasonal distribution of political influence and material resources. The decentralization of ephemeral social influence to include novel practices with the potential to generate material wealth seasonally helped to sustain a decentralized political organization across centuries and millennia among Botatwe-speaking societies, even as neighboring societies experimented with statecraft and the concentration of wealth and power (de Luna 2016).

Identifying Unknown Vulnerabilities. In the face of climate change, south central Africa is vulnerable to environmental threats like wildfires that will shift in frequency and character as vegetation and storminess changes across the region. This is particularly telling given indications of a long history of both wild and anthropogenic fires in the geoarchaeological record from the region (Pawlowicz et al. 2020). Although current policy largely seeks to take fire management out of the hands of local settlements, such work has been highly localized in the past and carefully articulated with forms of animal, game, and land husbandry rooted in immediate conditions. In Zambia, knowledge of human-fire-non-human interactions has been lost in some areas, resulting from the establishment of national parks, hunting and fishing laws and licenses, and new hybrid crops and forms of veterinary care (replacing the use of fire to manage insect born livestock diseases, for example). We are in need of research on past fire management practices and their effects on local vegetation, disease, and animal populations in this region of the world. We are also in need of policies that

facilitate the circulation of such knowledge at the local level in countries facing the fire threats of increased storminess with global climate change.

Identifying Sites and Foci of Policy-Relevant Research across Disciplines. Precisely because historical case studies have the potential to identify unimagined future environmental threats and past strategies for adaptation that are (for the time periods considered here) low-tech and often, therefore, low-cost strategies, practitioners of the historical disciplines that generate such studies should be at the table in policy discussions. Historians, archaeologists, historical linguists, and other specialists in historical sciences—particularly those who work on far earlier periods and the expansive scales of chronology and geography that match climate change—are also in a unique position to help determine and prioritize the geographical and chronological foci of natural science research on paleoclimate and environmental reconstruction. Such contributions to the natural science research agenda will improve our modeling of past and therefore future climate and environmental change in contexts for which we might also be able to develop low-tech, low-cost mitigation policies. This is of vital importance in contexts like rural Zambia.

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