

Climate and Culture: Anthropology in the Era of Contemporary Climate Change

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Abstract

This review provides an overview of foundational climate and culture studies in anthropology; it then tracks developments in this area to date to include anthropological engagements with contemporary global climate change. Although early climate and culture studies were mainly founded in archaeology and environmental anthropology, with the advent of climate change, anthropology's roles have expanded to engage local to global contexts. Considering both the unprecedented urgency and the new level of reflexivity that climate change ushers in, anthropologists need to adopt cross-scale, multistakeholder, and interdisciplinary approaches in research and practice. I argue for one mode that anthropologists should pursue—the development of critical collaborative, multisited ethnography, which I term “climate ethnography.”

INTRODUCTION

The purpose of this review is to first provide some history of climate and culture studies in anthropology, which, to date, have been based largely in archaeology and environmental anthropology,¹ and second, to discuss the contemporary context up to and including the rapidly emerging area of anthropology and climate change. This is no small task, which, owing to the limits of this review and the expansion of the field, is incomplete at least but necessary to bring some chronology to where we have come from to clarify where we are and what areas need more of our attention. To these ends, I argue that this emerging area introduces at least two nuances to the foundational climate and culture studies, namely an unprecedented sense of urgency and a new dimensional level of reflexivity. Both demand anthropological engagement that is cross scale, multistakeholder, and interdisciplinary in research and practice. They also demand nonanthropological engagement to realize truly transdisciplinary processes. I propose one approach to address these nuances is by developing what I term “climate ethnography.”

There is a growing body of literature on anthropological engagement with contemporary climate change (Brown 1999, Nelson & Finan 2000, Broad & Orlove 2007, Orlove 2005, Brondizio & Moran 2008, Strauss & Orlove 2003, Crate & Nuttall 2009), but the specific methods and praxis remain unclear. Early climate change researchers brought attention to anthropology’s unique offerings: for example, the agency of ethnographic and participatory methods to decipher the cognitive and cultural landscape in which farmers’ understanding of climate and climate information is grounded and the decision-making processes and environment which shape farmers’ adaptive strategies (Roncoli 2006). However, anthropo-

logical studies also revealed problems relating the specifics and multilayered complexities of local human experience to the generalities and abstractions of measurement in the global. Take, for example, this case of the failure of “top-down” methods to accommodate and even account for a local people’s concerns:

The long time horizons of the herders are hard to incorporate into such valuation as well. The herders’ concern for nonhumans also disappears from view within this framework; the animals, whose suffering is of concern to the herders, simply become an income source, and the mountain spirits vanish altogether, even though they matter a great deal to the herders. (Orlove 2009, pp. 160–61)

Additionally, interdisciplinary climate change research is often biased towards quantitative data and analysis, leaving social scientists expected to assume those tools of natural science, which do not accommodate sociocultural elements:

From the perspective of climate science, localizing has a specific meaning. It is the procedure of downscaling from global climate models... to specific places. Thus, localizing is a calculation, the resultant of another model... I argue that identifying climate change and localizing it though scientific expertise is an activity that is much more complex than “simply” calculating. A close examination of scientific practice makes clear that localizing is as much a problem for climate researchers as it is for ethnographers... Climate research offers an insight into a messy world of ramifications, surprising activities and unexpected “social” context. (Krauss 2009, pp. 149–50)

It is only through vigorous cross-scale local to global approaches and interdisciplinary projects, which effectively accommodate and integrate qualitative data, that anthropology’s offerings will bring the greatest contributions.

¹I use the term environmental anthropology to include any and all efforts that engage human-environment relationships and other anthropological subfields insofar as they have an environmental component.

As a cultural anthropologist, I continue to hear the call for new approaches in anthropology and climate change research. Anthropologists working as practitioners and in policy realms similarly echo this cry by promoting interdisciplinarity and cross-scale research in engaging climate change. As Puntenney (2009, p. 317) writes, “Progress in understanding sustainable systems and acting on this understanding requires collaboration and interaction between social scientists and related disciplines.” Fiske (2009, p. 288) furthers this by adding, “I suggest that anthropologists now change direction and become actors in the policy process . . . using the collaboration that has become a hallmark of our research to build relationships with other organizations, associations, think tanks, and foundations, who have a stake in this issue—or create new ones.”

As an ethnographer who has conducted long-term research since 1991 with communities in northeastern Siberia, I argue that, in the contemporary context of global climate change, to these ends we need a refocus of ethnography within anthropology. Others echo this sentiment:

Global warming introduces new disjunctions and inequities between local worlds, while established knowledge about the environment becomes destabilized. The “global” is what envelops the local all while becoming part of it . . . We need new ethnographies to show how this imbalance occurs and how people become literally unsettled as nature develops out of bounds. (K. Hastrup, personal communication)

Why specifically ethnography? Because it is a comprehensive method that capitalizes on anthropologists’ skills in “being there” (Roncoli et al. 2009) and, in its recent iterations, has the methodological power to bridge local understandings beyond the local to the multitude of stakeholders and on a multitude of scales. We could further engage Tsing’s recent “ethnography of global connection” (Tsing 2004), which “refers to an accounting of the global array of connections, in the case of global climate

change both physical and socio-cultural, that yield a specific climate change situation and inform local to global understanding and action” (McKenzie 2005, p. 157). Tsing encourages us to focus on zones of cultural friction, “zones of awkward engagement,” where words mean something different across a divide even as people agree to speak (Tsing 2004, p. xi). To bring this redefinition into a higher level for the climate change issue, I further argue for adopting methods of critical collaborative ethnography, which explicitly problematizes collaboration and makes it a central component of how climate ethnographers wish to address the gap between global and local.

To make my case, I first provide a brief overview of foundational climate and culture studies followed by an overview of anthropology’s main contributions to climate change investigations in the recent period. After focusing on some of the foundational areas where anthropologists have been and are contributing, I then use a more inductive approach to segue to a call for climate ethnography.

STUDIES OF CLIMATE AND CULTURE: AN OVERVIEW

Foundational Climate Culture Studies

Both archaeology and environmental anthropology provide the needed theoretical basis for contemporary climate and culture research. On a deep time scale, archaeologists have a strong history of investigating climate change and its relationship with cultural dynamics—resilience and decline, florescence and social structure (Anderson et al. 2006, Cruikshank 2005, Rosen 2007, Redman 1999). Similarly, the well-established subfields of environmental anthropology, including cultural ecology, cultural materialism, political ecology, and human ecology, also have a history of such investigation (Steward 1955, Netting 1968, 1996, Orlove 1980, Moran 1982, Milton 1993, Crumley 1994, 2001, Richerson 1996, Smith & Wishnie 2000, Robbins 2004). Here Barth (1969) is also a major reference on culture

and ecological boundary maintenance. Many of these earlier theoretical approaches were modeled on the natural science paradigms of rationality and objectivity. Some examples include the “culturology” of neoevolutionist Leslie A. White (1959), who elaborated lineal stages of cultural development on the basis of quantifiable energy consumption; Roy Rappaport’s application of the biologically derived ecosystem, delineating human beings as competing against many nonhuman populations and performing religious rituals to maintain ecological balance (1968); Marvin Harris’s cultural materialism that posits culture to be the result of constantly optimizing human efforts of ecological adaptation (1979); and Julian Steward’s theory of cultural ecology, focused on the interdependence and interaction between nature and culture as an incitement for technical innovation and culture change (1955).

These early works by anthropologists, from both archaeology and environmental anthropology, of the multifaceted interrelationship between culture and ecology—how cultures attribute meaning and value to their interpretations of weather and climate and how people have achieved and continue their adaptation to local climate, temperature, flooding, and rainfall (or lack of it)—are the core to contemporary investigations of climate and culture. The main differences are that these early studies in cultural materialism and cultural ecology lacked an accommodation for the “global array of connections” that contemporary climate change invokes.

Beginnings of Studies in Anthropology and Contemporary Climate Change

If scientific predictions are to be believed, environmental changes are going to be more extreme, more frequent, and more widespread than previously experienced in human history. But there have always been floods, fires, famines, and conflicts, and there is already a wealth of anthropological knowledge on how people deal with these disruptions to their lives. Although these problems may not be

new, the discourse of climate change, with its scientific, economic, political, and moral dimensions, is a relatively recent arrival in the global arena, and it is changing the way local events are framed and understood. For anthropologists to neglect it would be unthinkable (Milton 2008, p. 57).

To date much is known about the physical changes, both ongoing and projected, resulting from contemporary climate change (ACIA 2005, IPCC 2007). Natural scientists have generated more than sufficient proof to show the world that (a) contemporary global climate change is happening; (b) it is unprecedented in comparison to the natural climate change cycles of the past 600,000 years (time period based on ice core records of Antarctica); and (c) it is, to a significant degree, a result of human activity. So why is anthropology important? The critical piece of this phenomenon for anthropology is that, in addition to the above-mentioned physical transformations of the earth’s environment, contemporary global climate change has cultural implications. It follows that because “culture frames the way people perceive, understand, experience and respond to key elements of the worlds which they live in” (Roncoli et al. 2009, p. 87), anthropologists are strategically well-suited to interpret, facilitate, translate, communicate, advocate, and act in response to the cultural implications of unprecedented change (Crate & Nuttall 2009).

In the past two decades anthropology’s focus on climate and culture has evolved to include the dynamics of unprecedented contemporary climate change. It began with studies of the global environment, where we find anthropologists bringing to light the crucial role of people and culture in understanding land use and land-use changes—information critical to general circulation models that are used to predict ocean and climate change. Some anthropologists made early contributions to understanding the microlevel and ecosystem-level components of land-use change (e.g., Moran 1993, Moran & Ostrom 2005), focusing in climate-sensitive world regions where

environmental change has been most apparent. Concomitantly others helped formulate priorities of the “human dimensions” research agenda embodied in the National Academies report *Human Dimensions of Global Environmental Change: Research Pathways for the Next Decade* (Nat. Acad. Sci. 1999). Others looked more directly at humans’ role(s) and agency in the climate crisis (Rayner & Malone 1998), whereas still other anthropologists explored how public perceptions on the climate crisis varied (Kemp-ton & Payne 1997). These studies brought to the fore the inherent complexity in addressing climate change’s sociocultural aspects.

As studies evolved further, anthropologists’ research in diverse sites across the globe—from Burkina Faso to Brazil to the United States (particularly Arizona)—demonstrated how meteorological and atmospheric variability are consequential for human activity (Roncoli et al. 2000, Strauss & Orlove 2003). As climate change effects have proceeded and are more apparent to anthropologists in their field sites, be they located in a tribal village or a policy think tank, anthropologists have begun the necessary work of reorganizing and streamlining their efforts in the multitude of subfields and research contexts that demand the anthropological toolkit (Crate & Nuttall 2009, Baer & Singer 2009).

Overall, anthropologists have contributed substantially to climate change research, but we have an enormous potential to contribute much more. We work at many scales, from local to global, wear many different “hats,” from that of academic researcher to advocate, engage issues of culture by interpreting both cultural breakdown and culturally based responses, and continue to use some of anthropology’s foundational methodologies including ethnography, participant observation, interpretation, documentation, and the like but within a newer global context of issues, collaborators, and audiences.

CONTEMPORARY CLIMATE AND CULTURE STUDIES

This section reviews key foci of contemporary climate culture studies, divided into two

areas: (a) place-based community research and (b) global negotiations and discourses. For me it is logical to begin with the insight and progress from field-site research where I, and many anthropologists, began doing climate change research largely prompted by the concerns of our field collaborators. I review place-based community research involving foundational fieldwork with foci including ethnoclimatology, resilience, disasters and displacement, and resource management, specifically that of water. I then review global negotiations and discourses including studies in climate justice and policy, energy, and consumption.

Place-Based Community Research

One early and major contribution of anthropologists to contemporary climate change research included the documentation of how place-based peoples observe, perceive, and respond to the local effects of global climate change (e.g., McDonald et al. 1997, Krupnik & Jolly 2002). Founded in the essential capacity for local peoples to develop and practice adaptations to local variance, these new studies highlighted how adaptive strategies did not work as climate change pushed the boundaries of ecosystem variance. Since these seminal studies, anthropologists have initiated projects in other “climate-sensitive” areas of the world, including areas of high and low latitudes, high and low altitudes, near sea-level, and deserts (Salick & Byg 2007), where global climate change is having the most pronounced effects and often inhabited by place-based populations who depend directly on their immediate physical environment.

In this context, anthropologists began investigating how the local effects of global climate change undermine a people’s capacity not only to inhabit their homelands, but also to maintain their cultural orientations and symbolic frameworks that ground their specific adaptations (Crate 2008b, Crate & Nuttall 2009). These studies benefit from anthropologists’ long-term research in communities that often generate “thick description” (Marcus 1998) of

the necessary and context-specific set of tools for surviving and thriving in the local. They also highlight the moral and ethical implications of the world's diversity of peoples losing the very totem plants, animals, and landscapes that are central to their spiritual orientation and whose loss is also a loss of cultural identity and meaning (Rhoades et al. 2008, Salick & Byg 2007, Crate 2008b, Crate & Nuttall 2009, Cruikshank 2005, Nadasdy 2005, Nuttall et al. 2005). Four important foci of place-based community research in climate change include studies of ethnoclimatology, resiliency, disasters and displacement, and resource management.

The study of climate change in the context of place-based populations is directly related to the evolution of the field of ethnoclimatology. Ben Orlove and two meteorologist colleagues investigated the weather-forecast traditions of the central Andes and found that farmers observe the Pleiades star cluster, and depending on whether its appearance is bright or cloudy, forecast dry or rainy weather three months later to set their time for potato sowing (Orlove et al. 2002). The meteorological explanation corroborates the local people's understanding because the cloudy appearance of the Pleiades is an indication of the forthcoming arrival of the El Niño phenomenon, which prevents the regular precipitation in October. As studies in ethnoclimatology progressed and as climate change increasingly skewed the predictive capacities of local peoples, it became clear that local knowledge systems to predict weather patterns were becoming unreliable (Kanani & Pastakia 1999, Roncoli et al. 2002, Iwanciw et al. 2006, Kanani 2006). Some anthropologists began noting how these populations often integrated aspects of modern climate science (Orlove et al. 2009).

Anthropologists continue to work on ethnoclimatology in climate-sensitive world regions (for example, Taddei 2009, Garay 2010, Nuttall 2010), with some applying this same approach to place-based populations in the United States (Crane et al. 2010). This "bringing home" of research to show how populations domestically are facing the same challenges as their

counterparts worldwide is a powerful message that should be instrumental in informing U.S. advocacy and policy.

Studies using a resiliency framework are a second focus of place-based community research on climate change. These studies engage operationalizing constructs—largely borrowed from the discipline of ecology—to understand how a people's resilience and vulnerability in interaction with ecosystem feedbacks show how cultural factors and differences play a determining role in a group's adaptive success (see Nelson et al. 2009, Nelson & Finan 2009, Vásquez-León 2009). An important insight from these studies is how communities' adaptation to climate variation and change is not a simple function of technical solutions. On the contrary, human adaptation more often is determined by sociocultural relationships manifest in a web of reciprocities, obligations, and assets, including social capital—an asset important for access to resources in times of stress (Crane et al. 2010, Roncoli et al. 2009). One case in point is anthropologists working in pastoralist communities emphasize how important social capital is to bolster adaptive strategies under conditions of land fragmentation, a process further exacerbated by climate change (Galvin 2009). Larger interdisciplinary climate projects studying specific ecosystem responses to climate change give anthropologists a great opportunity to heighten awareness of and attention to these sociocultural relationships, for example, addressing the workings of a coupled marine system in the Northwest Atlantic (McCay et al. 2011, McCay 2010).

Because climate change pushes the limits of local ecosystem variance generating "disasters" and, in more climate sensitive areas, increasingly rendering locales uninhabitable, a third focus of climate research is disaster and displacement on both the physical and sociocultural levels (Button & Peterson 2009, Oliver-Smith 2009). Oliver-Smith (2009, p. 122) describes this cultural and social uprooting as the "second disaster." Because displacement and migration of populations interact with

governance, resource rights, and politics on both domestic and international levels, disaster and displacement anthropologists often work with international institutional initiatives, for example, with the United Nations' academic arm, the United Nations University, to provide the critical link of how local populations are being affected, how they are responding, and how issues of environmental and social vulnerability interplay (Oliver-Smith & Shen 2009). Disaster and displacement research within the climate change context shows how traditional emergency preparedness systems need to be adapted to accommodate the new challenges, for example, of temporal vulnerability, or how "temporal reference making practices such as landscape monitoring, memorialization, and meaning attribution influence population-level emergency preparedness" (De Vries 2007, 2008). Some argue for more anthropologists to apply their craft outside the academy and contribute to a new disaster-related public anthropology in contexts of climate research (Kelman & Gaillard 2010).

Resource management, specifically in relation to water, is a fourth focal area for anthropologists engaging place-based community research and climate change. Anthropologists have long engaged issues of water, especially as the world faces increasing shortages and pollution (e.g., Giblett 1996, Whiteford & Whiteford 2005, Ennis-McMillan 2006, Strang 2006). The climate crisis has ushered in a new dimension to anthropological engagement with water. IPCC climate scientist Bob Watson stated that the main issue of climate change for affected communities is chaotic water regimes fueled by an unprecedented change in both global temperature and precipitation patterns (Watson 2008). One area of water investigations regarding climate change is that of melting ice. In high-altitude areas anthropologists are studying the effects of rapid glacial melt on affected communities, both rural and urban (Orlove et al. 2008, Fromming 2009, Strauss 2009). Researchers who have worked in mountain communities for decades have begun to appreciate how the

climate crisis is altering long-held rituals and beliefs surrounding the annual cycle of snow pack and glacial melt (Cruikshank 2005, Bolin 2009). Those who have more recently entered the field focus specifically on perceptions and realities of unprecedented glacial melt water for peasant communities (Dunbar 2009). Research in India, for example, looks at climate change and water as a human rights issue. It does so by demonstrating how the combination of altered precipitation patterns and unprecedented melting of Himalayan glaciers negatively affects small-scale food production and other local uses of water and how these effects concomitantly interplay with the state's increasing dependency on large-scale hydropower and water transfers into the near future (Alley 2002).

Arctic anthropologists show how climate change's unprecedented melting of ice, both land-based (permafrost) and of the sea, challenges and threatens local adaptive strategies, both physical, including times and modes of travel, hunting, fishing, foraging, etc., and cultural (Krupnik et al. 2010). Degrading permafrost is resulting in sinking land and an increase of standing water across areas, rendering them unusable for resource use or food production. Research seeks to understand how these changes affect both local subsistence efforts and place-based cultural orientations to a sense of place and homeland (Crate 2008b; S. Crate, submitted manuscript, "A Political Ecology of Water in Mind").

Anthropologists are investigating a spectrum of issues related to too much water in the form of rising sea levels due to climate change, including displacement, adaptation, vulnerability, and the politics of development (Lazrus 2009, Finan 2009, Green 2009). Too little water in the western United States is another platform for anthropological engagement whether in the context of altered water resources within tribal areas that generate new questions about sovereignty (Colombi 2009) or in large-scale transdisciplinary projects established specifically to look at water in areas already water stressed (Wutich 2009, White et al. 2010, Crona et al. 2011).

Anthropologists are facilitating broad-based interdisciplinary policy initiatives to bring about new avenues to investigate and collaborate on issues of water and climate change (Johnston 2010). The social science issues of water and climate change open opportunities for anthropologists to engage effectively in the role of expert advisors in international efforts, for example, the UNESCO Water and Cultural Diversity Initiative, to find ways to mainstream social and cultural components into water sciences and management (UNESCO-IHP 2009).

Although research in anthropology and climate change is criticized by some as being too persistently and singularly identified with place-based community studies of indigenous peoples (and perhaps rightly so because that is a major source of early work), others argue for more research in this area exactly because it is a fertile microcosm in which to understand and develop methods and analysis for other world contexts, perhaps most importantly that of the Western consumer. Some examples of this direction include research frameworks, developed in indigenous and place-based communities of other world regions, being applied in Western contexts (Crate et al. 2010, Crane et al. 2010). Additionally, as place-based community research evolves, so does anthropologists' engagement with global connections and discourses.

Global Negotiations and Discourses

Climate change is a human rights and a human security issue. To these ends, anthropological initiatives often work to empower local populations, regions, and nation-states to seek redress (Wisner et al. 2007, Crate 2008a, Checker 2009). Climate justice, a reframing of environmental justice in the face of climate change, is one important focus for anthropologists, particularly those already working in the field of human rights and largely spurred by studies of displacement, migration, and forced relocation of affected communities. Studies highlight how, on the one hand, global climate change

is one more issue that local populations face in the context of contemporary globalization processes and how, on the other hand, it presents novel challenges, especially by rendering what were once suitable survival strategies as obsolete (Oliver-Smith 2009, Marino & Schweitzer 2009). One area that anthropologists as experts in local contexts play a key role is carbon offsets and REDD, which, although appearing to benefit local peoples, have raised serious equity concerns (Atmadja et al. 2011).

Many anthropologists are advocates for affected groups who have organized themselves to speak out for climate justice (e.g., <http://www.manystrongvoices.org>) and are involved in newly developed initiatives to bridge affected peoples with international policy and negotiations with the aim of empowering local communities (e.g., http://www.unutki.org/default.php?doc_id=13). To these ends, a number of anthropologists attended and participated in the 2009 Conference of Parties meetings in Copenhagen (Chernela et al. 2010).

Anthropologists also argue for more anthropological engagement in the policy stream (Rayner & Malone 1998, Brown 1999, Magistro & Roncoli 2001, Batterbury 2008, Crate & Nuttall 2009, Fiske 2009). Although the word "policy" implies some kind of relation (possibly even a stable relation) between politics and policy, climate policy is very different from older, more institutionalized areas of policy, and in consideration of the overall failure of the meetings in Copenhagen and Cancun, the term is largely up for grabs. One good illustration of this is how multiple issues collide as policies are reshaped to integrate greenhouse gas emission goals with existing conservation commitments (Fletcher 2010). The cultural complexity of political and corporate interests involved in climate policy is in its own right a nascent field in need of anthropological attention (Fiske 2009, Punttenney 2009). Lahsen's (2005, 2010) pioneering work conducting upward studies to understand perceptions, attitudes, responses, and power relationships of corporations, policy makers, researchers, and politicians in the world of climate change policy gives

anthropologists another powerful venue to apply their tools. Anthropologists are increasingly visible in negotiations at the United Nations as well as in international forums and working groups, where, for example, they provide clarity on the process of the United Nations Framework Climate Change Conference, on the construction of the Kyoto Protocol, and on the extent to which such protocol is formulated with a Western basis and will benefit Western nations first (Gutierrez 2007). Lastly, much anthropological research on climate change includes large-scale collaborative and interdisciplinary efforts that aim to provide a link between local realities and decision makers (White et al. 2010).

Another important aspect of global connections and discourse is anthropology's engagement with energy and consumption. Dating back to the works of Leslie White (1959), the field is experiencing a renaissance in the debates about the magnitude of cultural change required to transform levels of consumption in developed countries to meet the challenges of effective mitigation (Kempton et al. 2005, Bohren 2009, Wilk 2009). The expanding field and often-controversial local reality of carbon markets is also fertile ground for anthropologists. One project analyzes how farmers and ranchers are responding to carbon-sequestration protocols in land-use decisions in the western United States (L. Bohren, email communication), and another is investigating Western landowners' perceptions of mitigation via small-scale forestry (Charnley et al. 2010). A similarly expanding field within mitigation efforts is the transformation of the Western consumer lifestyle into a more carbon-neutral one (Wilk 2009). Anthropologists are involved in understanding ways to bring about more public involvement in this effort by studying intentional communities that are prioritizing carbon neutrality to discern what the social and cultural drivers of these efforts are and what policy obstacles and opportunities exist for them (Lockyer 2010). Anthropological research in this area also looks at how human perception interacts with how different interest groups

view and understand the climate crisis. Some are studying how Americans are more or less willing to base an acceptance of a global climate crisis on day-to-day temperature fluctuations (R. Stepp, email communication). Others are taking a more specific look at how different social groups within America are informed more by issues of meaning-making, ethics, and morality than by scientific authority when it comes to accepting contemporary climate change (Callison 2010).

In the final analysis, anthropologists have much to be congratulated for in terms of their contributions to local to global understandings of how climate change is affecting our worlds. We also need to push the boundaries further. Anthropologists need to become more globalized as agents for change by being more active as public servants and engaging more with nonanthropological approaches regarding climate change (Kelman & Gaillard 2010). Considering the moral, ethical, and human rights issues of climate change for most of the world's peoples, anthropologists need to take on climate change as a means to address the structural features of global inequality (Oliver-Smith 2010). Climate change challenges researchers in both the natural and social sciences to forge collaborative partnerships across disciplines as well as with various stakeholders (Lange et al. 1999).

Despite the flurry of activity by anthropologists engaging in issues of climate change and the status of anthropology and climate change as a rapidly expanding field, we continue to face obstacles to realizing effective engagement. Some believe that anthropologists simply do not have "what it takes" to work in large transdisciplinary projects owing to (*a*) their tendency to work as loners and (*b*) the difficulty inherent to bringing ethnographic and other qualitative findings into the fold of largely quantitative data sets. As one colleague commented, "I wish I could say that I am optimistic that anthropologists are going to expand their role in working on the causes of climate change, rather than tracking the disastrous results. I just don't see a lot of people getting into causal relationships" (Wilk 2009).

FUTURE DIRECTIONS FOR ANTHROPOLOGICAL ENGAGEMENT WITH CONTEMPORARY CLIMATE CHANGE

I have seen two *ugut jil* (big water years) in my lifetime. One was the big flood in 1959—I remember canoeing down the street to our kin’s house. The other is now. The difference is that in ‘59 the water was only here for a few days and now it does not seem to be going away.

Sakha elder, 2009

This testimony is one of many I have documented in the past few years working with Viliui Sakha communities on the local impacts of climate change in northeastern Siberia, Russia. I have worked on various projects with these same communities since 1991, on issues of ethnic revival (Crate 2006b), on household-level adaptive strategies since the fall of the Soviet Union (Crate 2003), on the local effects of regional diamond mining (Crate 2002), and on local definitions of future sustainability (Crate 2006a). Only in the past few years have my collaborators begun expressing their concern about changes in weather patterns, seasonal timing, and land formations that are affecting their subsistence and culture (Crate 2008b). Today they find it increasingly difficult to adapt to the inundation of hayfields, gardens, and pastures that prevent their use of substantial land areas and the harvesting of essential resources; to the changes in the quality and quantity of snow, preventing hunters and horse herds from accessing winter food; to the increased flooding that rots homes and other buildings and ruins transportation ways; and to the disrupted rain patterns in the temperate months that create droughts in spring and dampness in harvest times, affecting hay production (S. Crate, submitted manuscript, “A Political Ecology of Water in Mind”; S. Crate, submitted manuscript, “Exchanging Knowledge on Climate Change to Bolster Adaptation and Inform Policy”). My research with these communities and with regional scientists studying the issue show that,

although the reported changes are unprecedented and a majority of them can be, all or in part, directly related to global climate change, there exists no readily accessible/locally contextualized information about this global process for communities to have the full picture of what is occurring in their local environs, and in the process, to respond accordingly.

I include this window into my ethnographic experience to illustrate the power and promise of ethnography or what, in the scientific nomenclature, we could call long-term socio-cultural research. I argue in the Introduction that the emergence of contemporary climate change introduces at least two nuances in contrast to anthropology’s foundational climate and culture studies, namely an unprecedented sense of urgency and a new dimensional level of reflexivity, both of which demand anthropological engagement that is cross-scale, multistakeholder, and interdisciplinary in research and practice. They also demand nonanthropological engagement to realize truly transdisciplinary approaches. Here I build my case for one approach to address this through what I term climate ethnography.

Although contemporary anthropological engagement with climate change incites a new sense of urgency, this urgency often is lost owing in part to the phenomenon’s lag effect. A good analogy to this paradox is the sinking of the Titanic—many are aware that catastrophe is ensuing, yet a vast majority continues to, either by chance or design, stay in the dark and in denial. Anthropology’s task is to bridge what we know and those who know it with the rest to facilitate global understanding and reach. One example of anthropology responding to this urgency is proposing a “Red Book” for endangered cultures (Lempert 2010) to include all of earth’s humans. In many ways complicit in that new sense of urgency is a new level of reflexivity. Anthropology is founded in reflexivity—to “know” the other, we need to understand our own cultural context, frames, and assumptions to see “objectively.” With contemporary climate change we are tasked further to reflect on how the issue we are confronted by is a result

of our lifestyle, that is to the extent we engage in energy-intensive Western consumption.

“Whoever discovered water, it was not a fish” (Geertz 1996, p. 259). Geertz here suggests that because humans are in “place” the way fish are in water—immersed, dependent, supplied, given meaning, finding wisdom—then to “discover” place, we need to take the perspective of the other, not of that place, but from the outside looking in. In the context of climate change, Geertz’s analogy informs the argument for a new reflexivity to both engage the other and to see from that local place outward and clarify how those of us dependent on a Western consumer lifestyle need to transform our own culture’s ways of being. This new level of reflexivity incurs responsive reflection and action while also increasing anthropology’s moral responsibility to act and advocate.

CLIMATE ETHNOGRAPHY: WHAT IT LOOKS LIKE

But what exactly does this new level of engagement, this “climate ethnography,” I am proposing look like and how does it differ from, say, environmental ethnography? It will certainly include consideration of the other environmental issues populations face, or the multistressors of a dynamic human-environment system. But by using the term environmental ethnography, we lose both the urgency and reflexivity necessary to advance our methods to address climate change. Additionally, environmental ethnography diffuses the focus into many places and many issues. Climate ethnography, by contrast, is tied to the global phenomenon and communicates a sense of immediacy and of an ethnography with a mission. Put another way, this is ethnography for the world—whereas ethnography has its roots in describing the local for those specifically interested in that group or in making comparisons with other groups, this has a different mission and works across multiple scales, similar to Tsing’s redefined ethnography elaborated on earlier (2004).

What I am calling climate ethnography entails the development of a new multisited, critical collaborative ethnography that integrates

a refinement of how we account for human perceptions, understandings, and responses by both modifying resilience/adaptation frames and further developing cultural models.

Multisited

A decade ago Malone & Rayner (2001, pp. 175–76) identified a major hurdle to climate research: the scalar disparity between the global standpoint, typically based on a descriptive reliance on objectivity and distance to gain knowledge, and the local standpoint, characteristically based on an interpretive understanding founded on immersion in place and the insider need to know. These disparities continue to hamper many efforts, particularly work in interdisciplinary teams to address climate change effectively. One anthropological method to these ends is multisited ethnography.

Ethnography moves from its conventional single-site location, contextualized by macro-constructions of a larger social order, such as the capitalist world system, to multiple sites of observation and participation that crosscut dichotomies such as the “local” and the “global,” the “lifeworld” and the “system” (Marcus 1995). Researchers engaged in climate change projects recommend a shift to a “cross-scale, multi-sited research design and an interdisciplinary mix of interactive and structured tools and techniques” and “that the analytical focus be expanded to encompass local communities and their multiple action spaces as well as the higher spheres of decision-making, where policy and science are shaped” (Roncoli 2006). Multisited ethnography is intrinsic to new climate ethnography, because it involves the analytical engagement of local-global connections, ethnographers engaging in multisited work (in the traditional/conventional sense), and the studying with local populations in their many-layered interdependencies to get a broader sense of the issues as they crosscut different locales and populations. The multisited approach reveals the ways that the climate science world and social world are not separate but integral. As Krauss (2009, p. 152) notes, the “multi-sited

approach, covering a series of seemingly unrelated projects, enabled me to follow these actors in their effort to define global climate change and to localize it in the ‘real’ world.”

Critical Collaborative Ethnography

We can further expand our coverage to more stakeholders by employing a critical collaborative ethnographic method: “Indeed, the emergent and collective push for a collaborative ethnography is part of a much larger and time-honored effort to construct a more equitable social science” (Lassiter 2005). Collaborative ethnography is an important component for the larger project of climate ethnography, because by engaging multiple stakeholders in the ethnographic process, we fulfill our moral obligation to document and to carry through what the documentation means to ourselves and society. Through such ethnography we trace global processes locally and track how global processes are being articulated via local knowledge systems to elucidate the convergences and conflicts between the global to local conversations and understandings about climate change. Here we can apply Peacock’s (2007) concept of grounded globalism, in which global forces and local cultures rooted in history, tradition, and place reverberate against each other in mutually sustaining and energizing ways.

Collaborative ethnography engages in a whole range of negotiated meanings that may have complex implications, for example, the capacity to engage in actual dialogic exchange between local and global discussions of climate change. Furthermore, critical collaborative ethnography explicitly problematizes collaboration and makes it a central component of how climate ethnographers wish to address the gap between global and local (Breunlim & Regis 2009).

Integral to the development of climate ethnography is the refinement of methods for how we account for human perceptions, understandings, and responses. In the next two sections I discuss the use of an adaptation/resilience framework and application of

the methods of cognitive frames and cultural models.

Adaptation/Resilience

Resilience has thus been a matter of reorientation within the landscape. In this sense Arctic societies have been well equipped for integrating changes of various kinds, but there are limits as to how far adaptation can be stretched. With the effects of global warming, we may reach these limits, because we are now facing a convergent catastrophe, implying that two or more collateral disasters work to produce a major crisis. (Hastrup 2009)

Much climate change research uses a resiliency framework to analyze adaptation (Adger 2006). These studies have advanced anthropology and climate change and also left many anthropologists unsatisfied. To begin, it is a conceptual framework, albeit adapted for human systems, but invariably borrowed from ecology and systems thinking. It gives us only part of the picture. Adaptation, vulnerability, and resilience in humans are dependent on much more than the physical system and much more than can be captured using predictive models. Consider, for example, understanding migration, long thought to be an adaptive strategy, but within the context of climate change, it has become a “failure to adapt” (Oliver-Smith 2010). Such probing will necessarily include questions of what constitutes adaptation to a local ecosystem, and when ecosystem characteristics are altered beyond those that a population had originally adapted to, in what ways can the population further adapt and at what point are they forced to move. Again, anthropologists working in the diversity of world ecosystems will find a similarly diverse array of local cultural responses. Another criticism of using a resiliency/adaptation framework is that it often is used to serve the needs of outside organizations who use them in their top-down appraisals of the local while leaving communities in complacency when no further action to alleviate the situation comes about (Orlove 2009, pp. 131–32). Top-down

responses, in the form of government relief and social transfers, to alleviate the new extremes introduced by climate change can work to pacify locals, and in the end, render them more dependent and vulnerable (Nelson et al. 2009):

Our concern, therefore, is not that adaptation will not take place but, rather, that ignoring the complexity and constraints of adaptation will lead to differential outcomes including the loss of livelihoods, cultures, and identities. Adaptation is indeed a messy dynamic, but anthropological methods and perspectives lend themselves well to localized studies of global processes. The challenge is to present our insights at the larger table. (Nelson et al. 2009)

Anthropologists are increasingly aware of the limitations of these frameworks. Although some climate change researchers have attempted to make accommodations for the social aspect of resilience with a limited level of success (Adger 2000, p. 350), anthropologists have pinpointed the most significant, albeit mysterious, difference. Resilience in human terms depends for the most part on “how people perceive and conceptualize change—in short, one’s worldview goes some way to determine the kinds of adaptive strategies people utilize” (Nuttall 2009, p. 299).

Willing enough to investigate the material and organizational means by which whole communities fashion workable adaptations to the physical environment, ethnographers have been notably less inclined to examine the elaborate arrays of conceptual and expressive instruments—ideas, beliefs, stories, songs—with which community members produce and display coherent understandings of it. Consequently, little is known of the ways in which culturally diverse peoples are alive in the world around them, of how they comprehend it, of the different modes of awareness with which they take it in and (in the words of Edmund Husserl) discover that it matters. (Basso 1996, pp. 53–54).

There are movements in anthropology to address these limitations. Roncoli (2006, p. 83) suggests a move toward a “political ecology of adaptation”, by positing adaptation as a multi-scalar, multitemporal, multistakeholder ongoing process and not just an event of local communities reorganizing back to some semblance of stasis after unprecedented change.

Cognitive Frames/Cultural Models

Additionally, the methods of cognitive frames and cultural models have the potential to accommodate the sociocultural. Cultural models are defined as “presupposed, taken-for-granted models of the world that are widely shared by members of a society and that play an enormous role in their understanding of that world and their behavior in it” (Holland & Quinn 1987, p. 4). Investigating cultural models is important to understand both how climate change is affecting local cultural predilections and how communities can best integrate this new level of environmental change into their understandings and worldviews. Rosen (2007) demonstrates the need to consider how belief and cosmology shaped local perceptions of climate change from the Terminal Pleistocene through the Late Holocene, and Cruikshank (2005) elaborates how sentient belief magnifies and transforms the cultural implications and human understanding of unprecedented environmental change in the contemporary time. Studies utilizing cultural model and cultural consensus approaches to weather and climate change are fewer in number: The most noteworthy is Kempton et al. (1995), which focuses on global warming and how different “environmentalisms” can be accounted for by how stakeholder groups use cultural models of nature, weather, religion, and policy. Kempton et al. (1995) used both qualitative approaches and cultural consensus to build their cultural models. Paolisso (2003) used cultural model research to identify how Chesapeake Bay watermen incorporate changing weather patterns into their understanding of how best to sustainably manage the blue-crab fishery.

As a precursor to this proposed research, Paolisso has also called for the integration of cultural model research into anthropological research on climate change, specifically for the Chesapeake Bay (Najjar et al. 2010). Finally, Crate (2008b) has begun to frame ethnographic insights on climate change, myth, and cosmology for Viliui Sakha of Siberia using a cultural models approach. The investigation of the “cultural implications,” including the observations, perceptions, and understandings of and responses to trends and impacts of local change, is an area in need of great effort by anthropologists. The use of cultural models, cognitive frames, and ethnographic methods are some of the main tools for that work.

ONE WAY FORWARD

Assessing the impacts of and the processes driving climate change within the broader context of social and cultural change for the range of local to global humans—from place-based peoples and local communities to transnational corporations to Western consumer society—demands the development of innovative inter- and transdisciplinary methodologies between the natural and social sciences. It is a tall order and also our greatest opportunity. In short, anthropology’s role(s) are critical.

In this review I argue for one approach: a re-focus of ethnography to account for the global array of connections that focuses on zones of cultural friction, “zones of awkward engagement” (Tsing 2004, p. xi), and that explicitly problematizes collaboration itself and makes it a central component of how climate ethnographers wish to address the gap between global and local. From a base of multisited, critical collaborative ethnography with new multiscalar, multitemporal, multistakeholder measures of adaptation and cultural frames and cognitive models, the possibilities in climate ethnography are expansive. It is one set of tools for the task at hand. Implementation presents us with a great challenge. Anthropologists need to study and communicate the ethnography of science

(IPCC, United Nations, World Bank, and the deniers) and to become more comfortable with doing science by learning the language(s) of science. The immediate tasks toward an engaged climate ethnography are (a) to develop and refine our unique methods and (b) to learn the art and skill of effective collaboration.

The former requires not only that we bring these methods into their fullest, but also that we educate others about anthropology’s skill sets and epistemologies. The importance of understanding and attending to the sociocultural aspects of climate change is increasingly recognized as critical within and without anthropology. We need to establish our methods but also establish ourselves and our craft as something that is solid and sound. We need to educate others that our skills associated with “being there” and of participant observation and our other methods of “knowing” require highly developed skill sets. I argue that the best way to educate is to show others what anthropology can do, by rolling up our sleeves and getting to work. Although anthropologists are historically taught to work on their own and so often do not collaborate well in interdisciplinary teams, we can learn these skills now. Perhaps it would be worthwhile to begin experimenting by collaborating first with other anthropologists even in the context of a climate project in which each researcher worked at a different scale.

The environmental and the social complexity of global climate change is daunting for most, if not all, of earth’s human population. Because of this inherent complexity, there is no “silver bullet” explanation or solution. It is only through an integration of knowledge, from local to global, and via collaboration and cooperation across geographic, stakeholder, and geopolitical/socioeconomic scales that we will be able to reach understandings and find ways forward. Anthropology not only plays a central role, but also carries a large responsibility in bringing about this transformative epoch via its unique capacity to identify, track, describe, interpret, and communicate the human predicament.

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LITERATURE CITED

- ACIA. 2005. *Arctic Climate Impact Assessment*. Cambridge, UK: Univ. Cambridge Press
- Adger N. 2000. Social and ecological resilience: Are they related? *Prog. Hum. Geogr.* 24(3):347–64
- Adger N. 2006. Vulnerability. *Glob. Environ. Change* 16:268–81
- Alley K. 2002. *On the Banks of the Ganga: When Wastewater Meets a Sacred River*. Ann Arbor, MI: Univ. Mich. Press
- Anderson DG, Maasch KA, Sandweiss DH. 2006. *Climate Change and Cultural Dynamics: a Global Perspective on Mid-Holocene Transitions*. New York: Elsevier
- Atmadja SS, Vayda AP, Indritmoko Y. 2011. *Using Anthropological Methods to Study Carbon Leakage in REDD Projects*. Presented at Annu. Meet. Soc. Appl. Anthropol., Seattle, WA
- Baer HA, Singer M. 2009. *Global Warming and the Political Ecology of Health: Emerging Crises and Systemic Solutions*. Walnut Creek, CA: Left Coast Press
- Barth F, ed. 1969. *Ethnic Groups and Boundaries: The Social Organization of Culture Difference*. Prospect Heights: Waveland Press
- Basso K. 1996. Wisdom sits in places: notes on a Western Apache landscape. In *Senses of Place*, ed. S Feld, K Basso, pp. 53–90. Santa Fe, NM: SAR Semin. Ser.
- Batterbury S. 2008. Anthropology and global warming: the need for environmental engagement. *Austr. J. Anthropol.* 19(1):62–68
- Bohren L. 2009. Car culture and decision-making: choice and climate change in cultural anthropology. See Crate & Nuttall 2009, pp. 370–79
- Bolin I. 2009. The glaciers of the Andes are melting: indigenous and anthropological knowledge merge in restoring water resources. See Crate & Nuttall 2009, pp. 228–39
- Breunlin R, Regis KA. 2009. Can there be a critical collaborative ethnography? *Collab. Anthropol.* 2:115–46
- Broad K, Orlove B. 2007. Channeling globality: the 1997–98 El Niño climate event in Peru. *Am. Ethnol.* 34(2):283–300
- Bronzio ES, Moran EF. 2008. Human dimensions of climate change: the vulnerability of small farmers in the Amazon. *Philosoph. Trans. Royal Soc.* 363:1803–9
- Brown K. 1999. Climate anthropology: taking global warming to the people. *Science* 283:1440–41
- Button G, Peterson K. 2009. Participatory action research: community partnership with social and physical scientists. See Crate & Nuttall 2009, pp. 327–40
- Callison C. 2010. *Spinning climate change: how diverse social groups invest climate science with meaning*. PhD thesis. MIT, Boston
- Charnley S, Diaz D, Gosnell H. 2010. Mitigating climate change through small-scale forestry in the USA: opportunities and challenges. *Small-Scale Forestry* 9:445–62
- Checker M. 2009. Double jeopardy: carbon offsets and human rights abuses. *Counterpunch*, Sept. 9. <http://www.counterpunch.org/checker09092009.html>
- Chernela J, Crate S, Derman B, Johnson N, Maclin T, et al. 2010. Documenting COP-15: modes of participation and knowledge flows. *Anthropol. News* 51:21–22

- Colombi B. 2009. Salmon nation: climate change and tribal sovereignty. See Crate & Nuttall 2009, pp. 186–96
- Crane TA, Roncoli C, Paz J, Breuer N, Broad K, et al. 2010. Forecast skill and farmers' skills: seasonal climate forecasts and agricultural risk management in the southeastern United States. *Weather Clim. Soc.* 2:44–59
- Crate S. 2002. Co-option in Siberia: the case of diamonds and the Vilyuy Sakha. *Polar Geogr.* 26(4):289–307
- Crate S. 2003. Viliui Sakha adaptation: a subarctic test of Netting's smallholder theory. *Hum. Ecol.* 31(4):499–528
- Crate S. 2006a. Investigating local definitions of sustainability in the arctic: insights from post-Soviet villages. *Arctic* 59(3):294–310
- Crate S. 2006b. *Obuokai*: A unique integration of social meaning and sound. *J. Am. Folklore* 119(472):161–83
- Crate S. 2008a. Climate change and human rights. *Anthropol. News* 49(5):34–45
- Crate S. 2008b. Gone the bull of winter: grappling with the cultural implications of and anthropology's role(s) in global climate change. *Curr. Anthropol.* 49(4):359–95
- Crate S, Nuttall M, eds. 2009. *Anthropology and Climate Change: From Encounters to Actions*. Walnut Creek, CA: Left Coast Press
- Crate S, Paolisso M, Fiske S. 2010. Cultural and consensus models of climate change adaptation for the Chesapeake Bay. *NSF Rep.*, Natl. Sci. Found., Washington, DC
- Crona B, Gartin M, Wutich A, Westerhoff P. 2011. Urban ecological knowledge? Perceptions of water quality in a desert city. *Ecol. Soc.* In press
- Cruikshank J. 2005. *Do Glaciers Listen? Local Knowledge, Colonial Encounters, and Social Imagination*. Vancouver: UBC Press
- Crumley CL. 1994. Ch 1: Historical ecology. In *Historical Ecology: Cultural Knowledge and Changing Landscapes*, ed. C Crumley, pp. 1–13. Santa Fe, NM: Sch. Am. Res.
- Crumley CL. 2001. *New Directions in Anthropology and Environment: Intersections*. Walnut Creek, CA: Alta Mira
- De Vries DH. 2007. Being temporal and vulnerability to natural disasters. In *Perspectives on Social Vulnerability*, ed. K Warner. Bonn: United Nations/Stud. Univ. Res. Counsel Educ. Press
- De Vries DH. 2008. *Temporal vulnerability: historical ecologies of monitoring, memory, and meaning in changing United States floodplain landscapes*. PhD thesis. Univ. North Carolina, Chapel Hill
- Dunbar K. 2009. *Perceptions and realities of changing water availability: responding to a changing climate in the Peruvian Andes*. Presented at Annu. Meet. Am. Anthropol. Assoc., 108th, Philadelphia
- Ennis-McMillan MC. 2006. *A Precious Liquid: Drinking Water and Culture in the Valley of Mexico*. Belmont, CA: Thomson Wadsworth
- Finan T. 2009. Storm warnings: The role of anthropology in adapting to sea-level rise in southwestern Bangladesh. See Crate & Nuttall 2009, pp. 175–85
- Fiske S. 2009. Global change policymaking from inside the Beltway: engaging anthropology. See Crate & Nuttall 2009, pp. 277–91
- Fletcher R. 2010. *When environmental issues collide: climate change and contestation over water use in Costa Rica's Pacuare River Basin*. Presented at Annu. Meet. Soc. Appl. Anthropol. 70th, Merida, Mexico
- Fromming UU. 2009. Kilimanjaro's melting glaciers: on the colonial and postcolonial perception and appropriation of African nature. *Etnográfica* 13(2):395–416
- Galvin KA. 2009. Transitions: pastoralists living with change. *Annu. Rev. Anthropol.* 38:185–98
- Garay G. 2010. *Kenyah Badeng etnoclimatology: traditional forecasting systems and local responses to the ENSO cycle in central Borneo*. PhD thesis. Univ. Kent, Canterbury
- Geertz C. 1996. Afterword. In *Senses of Place*, ed. S Feld, K Basso, pp. 259–62. Santa Fe, NM: SAR Semin. Ser.
- Giblett R. 1996. *Postmodern Wetlands: Culture, History, Ecology*. Edinburgh: Edinburgh Univ. Press
- Gutierrez M. 2007. *All That is Air Turns Solid: The Creation of a Market for Carbon Sinks Under the Kyoto Protocol*. PhD thesis. CUNY, New York
- Green D. 2009. Opal waters, rising seas: how sociocultural inequality reduces resilience to climate change among indigenous Australians. See Crate & Nuttall 2009, pp. 218–27
- Harris M. 1979. *Cultural Materialism: The Struggle for a Science of Culture*. New York: Random House
- Hastrup K. 2009. *Topographical mementos: social responses to a changing climate in the Arctic*. Presented at IOP Conf. Ser. Earth Environ. Sci. doi: 10.1088/1755-1307/6/5/572027

- Holland D, Quinn N, eds. 1987. *Cultural Models in Language and Thought*. Cambridge: Cambridge Univ. Press
- IPCC. 2007. *Climate Change 2007: Impacts, Adaptation and Vulnerability*. Working Group II Summary for Policymakers. Geneva: IPCC Secretariat
- Iwanciw JG, Giles JC, Effen MA, eds. 2006. Vulnerabilidad y adaptación al cambio climático en las regiones del Lago Titicaca y los Valles Cruceños de Bolivia. *NCAP Rep.* http://www.nlcap.net/fileadmin/NCAP/Countries/Bolivia/Bolivia_V_A_REPORT01-02-06.pdf
- Johnston BR. 2010. *Water, culture, power*. Full-day session Presented at Annu. Meet. Soc. Appl. Anthropol. 70th, Merida, Mexico
- Kanani PR. 2006. Testing of traditional methods of weather forecasting in Gujarat using the participatory approach. In *Traditional Knowledge Systems of India and Sri Lanka*, ed. AV Balasubramanian, TD Nirmala Devi, pp. 125–44. Chennai: Center Indian Knowl. Syst.
- Kanani PR, Pastakia A. 1999. Everything is written in the sky! Participatory meteorological assessment and prediction based on traditional beliefs and indicators in Saurashtra. *Eubios J. Asian Int. Bioethics* 9:170–76
- Kelman I, Gaillard J. 2010. Challenges and opportunities of disaster-related public anthropology. *Asian J. Environ. Disasters* 1(2):117–37
- Kempton W, Boster JS, Hartley JA. 1995. *Environmental Values in American Culture*. Cambridge: MIT Press
- Kempton W, Firestone J, Lilley J, Rouleau T, Whitaker P. 2005. The offshore wind power debate: views from Cape Cod. *Coastal Manage. J.* 33(2):119–49
- Kempton W, Payne C. 1997. Cultural and social evolutionary determinants of consumption. In *Environmentally Significant Consumption: Research Directions*, ed. PC Stern, pp. 116–223. Washington, DC: Natl. Acad. Press
- Krauss R. 2009. Localizing climate change: a multi-sited approach. In *Multi-Sited Ethnography*, ed. MA Falzon, pp. 149–64. Abingdon: Ashgate
- Krupnik I, Aporta C, Gearheard S, Laidler G, Kielse Holm L, eds. 2010. *SIKU: Knowing Our Ice. Documenting Inuit Sea Ice Knowledge and Use*. New York: Springer
- Krupnik I, Jolly D, eds. 2002. *The Earth is Faster Now: Indigenous Observations of Arctic Environment Change*. Fairbanks, AK: Arctic Res. Consort. US
- Lahsen M. 2005. Technocracy, democracy and U.S. climate science politics: the need for demarcations. *Sci. Technol. Hum. Values* 30(1):137–69
- Lahsen M. 2010. The social status of climate change knowledge: an editorial essay. *Wiley Interdisciplinary Rev. (WIRE): Climate Change* 1:162–71
- Lange M, Cohen S, Kuhry P. 1999. Integrated global change impact studies in the Arctic: the role of the stakeholders. *Polar Res.* 18(2):389–96
- Lassiter LE. 2005. Collaborative ethnography and public anthropology. *Curr. Anthropol.* 46(1):83–107
- Lazrus H. 2009. The governance of vulnerability: Climate change and agency in Tuvalu, South Pacific. See Crate & Nuttall 2009, pp. 240–49
- Lempert D. 2010. A call to anthropologists to develop a red book for Endangered cultures. *Pract. Anthropol.* 32(4):9–13
- Lockyer J. 2010. Intentional community carbon reduction and climate change action: from ecovillages to transition towns. In *Low Carbon Communities: Imaginative Approaches to Combating Climate Change Locally*, ed. M Peters, S Fudge, T Jackson, pp. 197–215. Camberley, UK: Edward Elgar
- Magistro J, Roncoli C. 2001. Anthropological perspectives and policy implications of climate change research. *Clim. Res.* 19:91–96
- Malone E, Rayner S. 2001. Role of the research standpoint in integrating global-scale and local-scale research. *Clim. Res.* 19:173–78
- Marcus G. 1995. Ethnography in/of the world system: the emergence of multi-sited ethnography. *Annu. Rev. Anthropol.* 24:95–117
- Marcus G. 1998. *Ethnography Through Thick and Thin*. Princeton: Princeton Univ. Press
- Marino E, Schweitzer P. 2009. Talking and not talking about climate change in Northwestern Alaska. See Crate & Nuttall 2009, pp. 209–17
- McCay BJ. 2010. *Approaches to the human dimensions of climate change and fisheries*. Presented at Int. Symp. Clim. Change Effects Fish Fish. Forecast. Impacts Assess. Ecosys. Responses Eval. Manage. Strategies, April 26–29, Sendai, Japan

- McCay BJ, Weisman W, Creed CF. 2011. Coping with environmental change: systemic responses and the roles of property and community in three fisheries. In *World Fisheries: A Social-Ecological Analysis*, ed. R Ommer, I Perry, P Cury, K Cochrane, pp. 381–400. Oxford: Wiley-Blackwell
- McDonald M, Arragutainaq L, Novalinga Z. 1997. *Voices from the Bay: Traditional Ecological Knowledge of Inuit and Cree in the James Bay Bioregion*. Sanikiluaq, Ottawa: Can. Arctic Resour. Comm. Environ. Comm.
- McKenzie D. 2005. Connectivity and scale in cultural landscapes: A.L. Tsing. *Friction: An Ethnography of Global Connection*. *Landscape Ecol.* 22:157–58
- Milton K. 1993. Introduction: environmentalism and anthropology. In *Environmentalism: The View from Anthropology*, ed. K Milton, pp. 2–17. London: Routledge
- Milton K. 2008. Anthropological perspectives on climate change. *Aust. J. Anthropol.* 19(1):57–58
- Moran E. 1982. *Human Adaptability: An Introduction to Ecological Anthropology*. Boulder, CO: Westview
- Moran, E. 1993. Deforestation and land use in the Brazilian Amazon. *Hum. Ecol.* 21:1–21
- Moran E, Ostrom E. 2005. *Seeing the Forest and the Trees: Human-Environment Interactions in Forest Ecosystems*. Cambridge: MIT Press
- Nadasdy P. 2005. *Hunters and Bureaucrats: Power, Knowledge, and Aboriginal-state Relations in the Southwest Yukon*. Vancouver: UBC
- Najjar RG, Pyke CR, Adams MB, Breitburg D, Hershner C, et al. 2010. Potential climate change impacts on the Chesapeake Bay. *Estuarine Coast. Shelf Sci.* 86:1–20
- Natl. Acad. Sci. 1999. *The Human Dimensions of Global Environmental Change: Research Pathways for the Next Decade*. Washington, DC: Natl. Acad. Press
- Nelson D, Finan T. 2000. The emergence of a climate anthropology in northeast Brazil. *Pract. Anthropol.* 22(4):6–10
- Nelson D, Finan T. 2009. Praying for drought: persistent vulnerability and the politics of patronage in Ceará, Northeast Brazil. *Am. Anthropol.* 111(3):302–16
- Nelson D, West C, Finan T. 2009. Introduction to “In Focus: Global Change and Adaptation in Local Places.” *Am. Anthropol.* 111(3):271–74
- Netting RM. 1968. *Hill Farmers of Nigeria; Cultural Ecology of the Kofyar of the Jos Plateau*. Seattle, WA: Univ. Wash. Press
- Netting RM. 1996. Cultural ecology. In *Encyclopedia of Cultural Anthropology*, ed. D Levinson, M Ember, pp. 267–71. New York: Henry Holt
- Nuttall M. 2009. Living in a world of movement: human resilience to environmental instability in Greenland. See Crate & Nuttall 2009, pp. 292–310
- Nuttall M. 2010. Anticipation, climate change, and movement in Greenland. *Inuit Stud.* 34(1):21–37
- Nuttall M, Berkes F, Forbes B, Kofinas G, Vlassova T, et al. 2005. Hunting, herding, fishing and gathering: indigenous peoples and renewable resource use in the Arctic. *ACIA (Arctic Climate Impact Assessment) Sci. Rep.*, Int. Arctic Sci. Comm., Fairbanks, AK
- Oliver-Smith A. 2009. Climate change and population displacement: disasters and diasporas in the twenty-first century. See Crate & Nuttall 2009, pp. 116–36
- Oliver-Smith A. 2010. *Defying Displacement: Grassroots Resistance and the Critique of Development*. Austin: Univ. Texas Press
- Oliver-Smith A, Shen X, eds. 2009. *Linking Environmental Change, Migration and Social Vulnerability*. Bonn: United Nations Univ.
- Orlove B. 1980. Ecological anthropology. *Annu. Rev. Anthropol.* 9:235–73
- Orlove B. 2005. Human adaptation to climate change. *Environ. Sci. Policy* 8:589–600
- Orlove B. 2009. The past, the present and some possible futures of adaptation. In *Adapting to Climate Change: Thresholds, Values, Governance*, ed. N Adger, I Lorenzoni, K O’Brien, pp. 131–63. Cambridge: Cambridge Univ. Press
- Orlove B, Chiang J, Cane M. 2002. Forecasting Andean rainfall and crop yield from the influence of El Niño on Pleiades visibility. *Nature* 403:68–71
- Orlove B, Roncoli C, Kabugo M, Majugu A. 2009. Indigenous climate knowledge in southern Uganda: the multiple components of a dynamic regional system. *Clim. Change* 100(2):243–65
- Orlove B, Wiegandt E, Luckman V, eds. 2008. *Darkening Peaks: Glacier Retreat, Science and Society*. Berkeley: Univ. Calif. Press

- Paolisso M. 2003. Chesapeake Bay watermen, weather and blue crabs: cultural models and fishery policies. In *Weather, Climate and Culture*, ed. S Strauss, B Orlove, pp. 61–82. Oxford, UK: Berg
- Peacock J. 2007. *Grounded Globalism*. Athens, GA: Univ. Georgia Press
- Puntenney PJ. 2009. Where managerial and scientific knowledge meet sociocultural systems: local realities, global responsibilities. See Crate & Nuttall 2009, pp. 311–26
- Rappaport RA. 1968. *Pigs for the Ancestors: Ritual in the Ecology of a New Guinea People*. New Haven: Yale Univ. Press
- Rayner S, Malone EL. 1998. *Human Choice and Climate Change*. Columbus, MO: Battelle
- Redman CL. 1999. *Human Impact on Ancient Environments*. Tucson: Univ. Arizona Press
- Rhoades R, Rios X, Ochoa J. 2008. Mama Cotacachi: local perceptions and societal implications of climate change, glacier retreat, and water availability. In *Darkening Peaks: Mountain Glacier Retreat in Social and Biological Contexts*, ed. B Orlove, E Wiegandt, B Luckman, pp. 218–27. Berkeley: Univ. Calif. Press
- Richerson P, Borgerhoff-Mulder M, Vila B. 1996. *Principles in Human Ecology*. Boston: Pearson Custom
- Robbins P. 2004. The hatchet and the seed: What is political ecology? In *Political Ecology: A Critical Introduction*, ed. P Robbins, pp. 3–16. Malden, MA: Blackwell
- Roncoli C. 2006. Ethnographic and participatory approaches to research on farmers' responses to climate predictions. *Clim. Res.* 33:81–99
- Roncoli C, Crane T, Orlove B. 2009. Fielding climate change in cultural anthropology. See Crate & Nuttall 2009, pp. 87–115
- Roncoli C, Ingram K, Kirshen P. 2000. Opportunities and constraints to using seasonal precipitation forecasting to improve agricultural production systems and livelihood security in the Sahel-Sudan region: a case study of Burkina Faso. CFAR-Phase 1. In *Proc. Int. Forum Clim. Predict. Agric. Dev. Predict.*, Int. Res. Inst. Climate Predict., IRI-CW/OO/1, November, pp. 265–77
- Roncoli C, Ingram K, Kirshen P. 2002. Reading the rains: local knowledge and rainfall forecasting in Burkina Faso. *Soc. Nat. Resour.* 15(5):409–27
- Rosen AM. 2007. *Civilizing Climate: Social Responses to Climate Change in the Ancient Near East*. Lanham: Alta Mira
- Salick J, Byg A, eds. 2007. *Indigenous People and Climate Change*. Oxford: Tyndall Center Clim. Change Res.
- Smith EA, Wishnie M. 2000. Conservation and subsistence in small-scale societies. *Annu. Rev. Anthropol.* 29:493–524
- Steward JH. 1955. *Theory of Culture Change*. Urbana: Univ. Ill. Press
- Strang V. 2006. Introduction: fluidscapes: water, identity and the senses. *Worldviews* 10(2):147–54
- Strauss S. 2009. Global models, local risks: responding to climate change in the Swiss Alps. See Crate & Nuttall 2009, pp. 166–74
- Strauss S, Orlove B. 2003. Up in the air: The anthropology of weather and climate. In *Weather, Climate and Culture*, ed. S Strauss, B Orlove, pp. 3–14. Oxford: Berg
- Taddei R. 2009. The politics of uncertainty and the fate of forecasters: climate, risk, and blame in northeast Brazil. In *Weather, Local Knowledge and Everyday Life: Issues in Integrated Climate Studies*, ed. V Jankovic, C Barboza, pp. 287–96. Rio de Janeiro: MAST
- Tsing A. 2004. *Friction: An Ethnography of Global Connection*. Princeton: Princeton Univ. Press
- UNESCO-IHP Expert Advisory Group on Water and Cultural Diversity. 2009. Mainstreaming cultural diversity in water resources management. *UNESCO Policy Rep.*, Int. Hydrol. Prog., Paris. http://www.ias.unu.edu/resource_centre/Updated%20Programme%20Water%20Symposium%20Oct%201-3%2009.pdf
- Vásquez-León M. 2009. Hispanic farmers and farmworkers: social networks, institutional exclusion, and climate vulnerability in southeastern Arizona. *Am. Anthropol.* 111(3):289–301
- Watson B. 2008. *The social and ethical dimensions of climate change*. Presented at World Bank's Int. Workshop Soc. Dimen. Clim. Change, March 5–6, Washington, DC
- White DD, Wutich A, Larson KL, Gober P, Lant T, Senneville C. 2010. Credibility, salience, and legitimacy of boundary objects: water managers' assessment of a simulation model in an immersive decision theater. *Sci. Public Policy* 37(3):219–32
- White L. 1959. *The Evolution of Culture: The Development of Civilization to the Fall of Rome*. New York: McGraw-Hill

- Whiteford LM, Whiteford S. 2005. *Globalization, Water & Health: Resource Management in Times of Scarcity*. Santa Fe, NM: Sch. Am. Res. Press
- Wilk R. 2009. Consuming ourselves to death: the anthropology of consumer culture and climate change. See Crate & Nuttall 2009, pp. 265–76
- Wisner B, Fordham M, Kelman I, Johnston BR, Simon D, et al. 2007. *Climate change and human security*. <http://www.radixonline.org/cchs.html>
- Wutich A. 2009. Water scarcity and the sustainability of a common pool resource institution in the Urban Andes. *Hum. Ecol.* 37(2):179–92



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