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CONSERVING BIODIVERSITY AND SUSTAINING CULTURES: OPPORTUNITIES AND CHALLENGES

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INTRODUCTION

In this paper we address the opportunities and challenges at the practical level in integrating efforts to conserve biodiversity and sustain cultures. Around the world, indigenous nations, aboriginal peoples, local communities, and peoples who were systematically and categorically classified as “marginal” within their nation-states have engaged in struggles to maintain their autonomy and rights to land and territory. At the same time, biodiversity conservation activities arose in response to an international spotlight illuminating the rapid loss of forests, wetlands, savannahs and other ecosystems that were often the homelands of these same peoples. For most of the past three decades, these movements have had largely separate trajectories, despite geographical overlap and somewhat overlapping common threats. While integrated efforts to sustain cultural and biological diversity have progressed, severe challenges remain. The objective of this paper is to determine where and how people have developed initiatives to integrate conservation of biodiversity with support and validation of the maintenance of the lifeways of local peoples.

This is not an easy task for a number of reasons. Not all local communities have the same values, aspirations, and visions for the future of the natural world surrounding them and for their cultural practices, lifeways, and languages. Community members hold a diversity of viewpoints and motivations; the most visible opinions within a community are not necessarily shared by the majority of the community (Agrawal and Gibson 1999). In addition, those who work on these issues, from biologists to anthropologists, to donor organizations, to local communities and indigenous advocates, have external and internal pressures that drive what they do and how they

interact with others. Furthermore, the motivations and actions of individuals and groups are often alternately romanticized or demonized; individuals are stereotyped based on their training in biology or social sciences or based on the nature of the organization where they work (e.g., large non-profit, small grassroots organization). We are explicitly working to avoid these problems: first, by acknowledging the complexity and diversity of opinions; and second, by seeking to focus on the question of why some people are able to recognize, cherish, conserve, and defend their unique environments and their unique identities within these environments in the face of global homogenizing processes. How do they accomplish this and what can we learn from them? What are the practices, ideologies, and governance structures in these situations?

We begin by tracing the early history of efforts to conserve biodiversity, describe the recent thinking on understanding cultural diversity, and provide a brief commentary on problems with diversity maintenance efforts to date. We detail several primary factors leading to both the loss of biological diversity and cultural practices. Finally, we highlight some informative case studies that illustrate instances where people have worked to conserve biodiversity in ways that respect and value the local perspective on natural resources, and we proffer a suite of recommendations for those interested in looking to future efforts to integrate these diversity initiatives across scales.

What Do We Mean By “Conserving Biodiversity?”

At the root of biodiversity conservation efforts, of course, is the issue of how to define and value biodiversity. Different organizations embrace narrower or broader and simpler or more detailed definitions of biodiversity ranging from very basic “all life on earth” to those that detail the levels of biodiversity (genes to ecosystems) to those that include ecological and evolutionary processes, to those that encompass human/cultural diversity (Gaston and Spicer 2004; Groom et al. 2006; Pretty et al. 2008; Harmon et al. 2008). How one defines biodiversity dictates what conservation actions and measures are appropriate. This is also true about how one defines conservation (Macdonald 2003). Outcomes-based conservation focuses on the areas conserved: “the maintenance of essential ecological processes and life-support systems, the preservation of genetic diversity, and the sustainable utilization of species and ecosystems” (Talbot 1980). Process-based conservation incorporates conflicts and conversations into its definition: “[c]onservation is a social and political process by which natural resources...are managed to maintain biodiversity” (Alcorn 1995). Our aim in this paper is to highlight the diversity of approaches to conserving biodiversity rather than to emphasize and validate one definition to the exclusion of others.

Biodiversity conservation efforts have shifted emphases and practices over time, based in part on our growing understanding of the biological, social, and cultural complexity of the task and also based on the institutional structures implementing the conservation actions. The same biodiversity element has different characteristics, different boundaries, and different relationships with humans depending on the scale of analysis and the people undertaking the analysis. There is a long and patchily documented history of conservation activities undertaken by political, national, and social elites, with an emphasis on codified practices that reserved resources for the wealthy and or powerful. There is a less-documented history of communities establishing sacred sites or spaces that range from individual sacred trees to large landscapes

managed akin to contemporary conservation reserves (Ramakrishnan *et al.* 1998, Chandran and Gadgil, Pei 1993, Wilson 1996, Castro and Tibetts 2001, Chouin 2002, Sheridan 2001, Ranger 1998, Byers *et al.* 2001). Often these spaces encompassed ecologically important species that humans depend upon such as *Ficus* (Moraceae) or *Canarium* (Burseraceae) (MacDonald 2003).

The roots of contemporary Western biodiversity conservation efforts focused on two opposing concepts, both based on flawed understandings of ecological and evolutionary processes. The first emphasized the importance of rare species and “old growth” wilderness areas, with a philosophy of preservation dictating the exclusion of humans from these areas (Cronon 1996; Pinchot 1947; and see Jacoby 2001 for a compelling history of the early thinking in the United States conservation movement). This viewpoint embraced a preconception of ecological systems as evolving on a fixed course towards “climax” communities that were imagined as static and “at equilibrium.” Humans were singularly conceived of as disruptive and external to ecological systems and their presence was equated with threat (Brockington 2002; Terborgh 1999; Oates 1999). With this conception of ecological systems, solutions to loss of biodiversity often focused on placing a “fence” around places, excluding people (generally through reserves and protected areas), and letting “nature” take its course (Borgerhoff-Mulder & Coppelillo 2005; Brown 1998; Colchester 1992, 2005; Peluso 1994; Scheil and Lawrence 2004).

The second conceptual framework focused on utilitarian views of wildlife and wildlands that called for multiple-use scenarios including humans as part of the solutions with an emphasis on game species and rapid productivity over rare species and “climax” communities. For the most part, individual species or parts of systems were “managed” as if they were not influenced by or did not significantly influence other parts of the system and there was little concern for the effects of managing generally more common hardwood or game species on rare or unique species or systems (Holling and Meffe 1996). Worldwide fisheries management provides some dramatic examples of how reductionist management of a resource can lead to unexpected consequences, and ultimately, collapse of the fish stock resource. Just as one example, the concept of maximum sustainable yield for managing the harvesting of fish stocks led to an overestimate of the amount of fishing that could be maintained over time in the Peruvian Anchovy fishery. An El Niño year (1972), with higher-than-normal sea surface temperatures in the Southern Hemisphere, led to decreased anchovy fecundity and survivorship, but fishery managers did not account for this change in the fishing quotas and fishing continued unabated. The fishery has never recovered from the resulting dramatic collapse (Caviedes 1984; NOAA 2008).

Both the preservationist and the utilitarian frameworks placed an emphasis on preserving pattern – focused on contemporary species or population numbers and relationships. In the late 20th century, ecologists challenged these assumptions, finding in their research that ecological communities are dynamic, continually evolving, and do not leading to one static climax community (Botkin 1990; Pickett *et al.* 1992). This approach pointed to the potential inadequacy of previous frameworks and solutions - traditional parks and protected area strategies - in conserving some elements of biodiversity. As one example, the endangered Furbish’s Lousewort (*Pedicularis furbishiae*), a small herbaceous North American plant of the snapdragon (Scrophulariaceae) family, depends on relatively regular flood disturbances to maintain its populations. Individual populations get washed out and plants/seeds reestablish downstream in

disturbed areas. Establishing a reserve in a small riparian zone of the St. John's River to protect a population in one year might result in that population going extinct another year and the reserve containing no Louseworts. No single spot along the riverbank is adequate for conserving populations due to the species' ephemeral habit. Furthermore, measures beyond the extent of the riparian zone would need to be implemented to maintain the disturbance regime for sustaining healthy populations of the species (USFWS 2005, Menges 1990).

As awareness grew about the importance of identifying a suite of conservation strategies, so, too, grew understanding that what conservationists now consider "wild" areas are sometimes the product of a long history of humans interacting with and shaping species and ecosystems and biodiversity and agroecological patterns that we see now are the result of long-term often intensive management of whole landscapes (Balée 1989, 2006; Brosius & Russell 2003; Erickson 2000, 2006; Foster et al. 2003; Gillson and Willis 2004; Heckenberger et al. 2007; Jackson et al. 2001; Marjokorpi & Ruokolainen 2003).

Viewed from a framework that incorporates pattern AND process; biodiversity AND human livelihoods, we need a toolbox of solutions that move beyond the traditional command-and-control conservation strategies. Protected areas are one potential tool for maintaining diversity, but their design needs to incorporate dynamic processes in order for them to function effectively through time and they are clearly not the only, or possibly even main strategy that could be employed in conservation efforts (Bawa 2006). Conservation biologists have tried to address dynamic ecological and evolutionary processes by developing flexible and evolving management systems such as adaptive management¹, though significant challenges remain in how to implement these systems (Holling, 1978; Ringold et al., 1996).

Sustaining cultural practices, livelihoods, and languages

As with "biodiversity," static, decontextualized conceptions of "culture" as timeless and fixed in a particular geographic location (Garcia Canelini 1995) have impeded efforts to sustain diverse livelihoods and to understand how culture matters with respect to Earth's diminishing biological diversity. Culture, in its traditional gloss as shared systems of values, norms, symbolic structures, beliefs and ideas that social actors make use of in experiencing the world, remains an overly simplified and static narrative framework that has often failed to take into account the historically generative dynamic of societies in natural space, the resilience and adaptability of people in the face of change, and the often creatively frictive internal diversity of these "communities" (Escobar 1999, Ingold 2002, Tsing 2000, 2005, Cocks 2006). Similar modernist logics of economic rationality and centralized control that conceptually transformed biodiversity into a set of measurable and exploitable commodities produced "cultures" as a collection of bound and manageable communities, knowable and discrete.

¹ Adaptive management incorporates the recognition that no manager fully comprehends the important driving forces in the ecological system for which he or she is responsible. Therefore, all management interventions are conceived of as testable hypotheses, and multiple interventions are employed at the same time so as to maximize learning and minimize management inertia. "Adaptive management involves integrating project design, management, and monitoring to provide a framework for testing assumptions, adaptation and learning" (Margoluis & Salafsky 1998, cited in (Stem et al. 2005).

While rationalist reductions of culture and biodiversity continue to underpin many governmental development projects, social scientists no longer view culture simply as something known and shared among like-minded people. Rather, culture is understood as something with no central tendency, with no single authoritative voice but rather a multitude of different voices that change over time. As with biodiversity, the same social/cultural community has different characteristics, different boundaries, and different relationships with the natural world around it depending on the scale of analysis and the people undertaking the analysis (Appadurai 1996; Bhabha 1994; Gupta & Ferguson 1992, 1997; Hannerz 1996; Malkki 1992; Rosaldo 1989; Tsing 1993).

This relatively recent recognition in the social sciences that culture is open, fluid and dynamic and that people are increasingly located simultaneously in multiple systems of cultural flow, has broadly refocused social inquiry from imagined “bound centers” of cultural stability to internal and external “borderlands,” sites of “complex connectivity” and cross-fertilization (Harvey 1996; 2006; Gupta and Ferguson 1997; Ong 1999; but see Kirsch 2001), where intertwining social, political and economic processes, simultaneously producing place and driving cultural identity are negotiated, contested and resisted (Peet and Watts 1996, Appadurai 1988b, Breckenridge and Appadurai 1989). We are also now more frequently finding ways to integrate the concept of agency in biodiversity conservation and sustaining local peoples’ cultural autonomy (Ahearn et al. 2001; Archer 1988, Bhabha 1994, Bourdieu 1977, Bousquet et al., 2001; de Certeau 1984, Giddens 1979, Johnson 2003, Ortner 2001, Spivak 1985, Sztompka 1993).

Internationally and nationally driven efforts to sustain distinct communities, cultures and livelihoods have taken three tacks, all of which have only tangentially (if at all) taken into account the more processual conceptualizations of culture described above. The first has defined culture largely by the products of aesthetic expression (sculpture, painting, drawing and other visual arts; music; literature; theater performances; films; and oral histories) and is exemplified by activities of UNESCO (*World Culture Report*). This tack has led to some policies recognizing the value of diverse artistic practices and the protection of intellectual property. However, it has sometimes ossified artistic production into static categories such as “folk art,” “primitive art,” and “non-Western art,” making it difficult for artists to gain recognition for work informed by intersections of different cultural traditions and genres as well as those celebrating biodiversity beyond the traditional geographic confines of that culture.

The second is what Harmon et al. (2008) calls “cultural goods” – access to schooling, Western health care, telecommunications, and increased cash income and is promoted as “social and economic development” or “modernization” through groups such as bilateral and multilateral donors and is captured in UNDP’s *Human Development Report*. Efforts to expand cultural goods have often focused on indigenous and local populations as “poor” by the standard of international measurements (e.g. per capita income, lack of community infrastructure, low life expectancy). As has been documented for decades by anthropologists and other social scientists, this Development Paradigm, despite its stated objective, has not necessarily alleviated poverty, but certainly has encouraged the expansion of the world economy (Escobar 1995; Rahnema 2006; Scott 1998), and it regularly overlooks heterogeneity, complexity and agency within communities (be they indigenous peoples, urban poor, or rural small holder fishing and farming communities). In some cases, external conceptions and expectations regarding the pervasiveness

of “poverty” and the cultural implications inherent to technical poverty indicators actually produced impoverished identities in practice.

The third definition of culture has focused on specific practices and livelihood strategies such as the maintenance of farming methods that increase agrobiodiversity, subsistence-oriented non-intensive natural resource use, and reliance on non-timber forest products. International and national institutions or organizations intent on fostering protection for these strategies have stressed the role of language diversity, traditional environmental knowledge, distinct religious and spiritual beliefs and cosmovision (expressed in rituals, myths, and daily practice) social relationships based on reciprocity and kinship, and communal organizational structures designed to promote greater egalitarianism. This effort is associated both with political and social activism on behalf of oppressed indigenous or minority populations and with activism for community-based natural resource management.

In part due to the difficulty in “branding” these last interrelated sets of variables, those interested in defending and expanding autonomy for indigenous and traditional peoples have looked to documenting languages as one measurable indicator (Harmon et al. 2008) of the social health of these communities. They point out that languages around the world are declining for a variety of reasons, including government suppression of local languages, globalization, migration, intermarriage, etc. Harmon (2002) estimates that 80% of languages are spoken by 10,000 people or fewer and that roughly 3000 languages – about 50% of all living languages – are in danger of becoming extinct in the next century.

There is a growing awareness around the world about language endangerment as well as the importance of language documentation, maintenance, and revitalization (Crystal 2000; Dorian 1992; Hill 2001; McCarty 2003; Hinton and Hale 2001; Moore 2006; Florey forthcoming a, b), and effective assessments of language vitality (Florey 2005). These efforts will help us to better understand how languages are structured to convey and transmit people’s diverse values, beliefs, knowledge, and practices concerning human-natural environment interactions (Maffi 1998, 1999, 2000, 2001b and references therein, 2005; Florey 2001; Nabhan 2002; Harrison 2007) and how we can best work to sustain their diversity.

Around the world, some linguists concerned with what they see as an escalating loss of languages have traditionally focused on documenting existing language use (predominately structural elements such as grammar and vocabulary), through transcriptions and development of dictionaries. Given the diversity of languages, dialects, and pidgins in the world, it is impossible to implement this level of depth with every manifestation of difference so by nature the process of developing a dictionary and documenting a language focuses on one dialect to the exclusion of others. This can lead to the lack of attention to the variety within and between languages. The mere process of writing down a language codifies a certain turn of phrase or way of thinking, again to the exclusion of others. Also, almost 50 percent of all languages do not have a written form and therefore may lose expression or nuances as spoken tradition is converted to writing (Moore 2006). These efforts to document structural elements of languages overlook the richly contextual cultural information on when, how, and why words or phrases are used.

Studies of local or traditional ecological knowledge (TEK) can help to shed light on the maintenance of cultural practices as well as to link culture and biodiversity, as information about the natural environment is embedded in the lexicon, grammar and discourse of local languages (Brush 1995; Maffi 1998, 2001a, 2001b, 2005; Crystal 2000; Nettle and Romaine 2000; Pawley 2001). Yet relatively few empirical studies have examined the relationship between TEK and languages and much of the existing research is still anecdotal or preliminary (*Zent in litt.*). There are no findings of substance that analyze causality or the directionality of change/loss—i.e. does language loss lead to or influence the loss of TEK, or are both part of a cluster of loss driven by external factors (globalization, dispossession, marginalization, migration/demographic change, intermarriage, etc.). Clearly more work needs to be done in this area.

The rhetorics of language loss and biodiversity loss are indeed isomorphic and raise some of the same questions about motivations and objectives in conflating their maintenance. Language loss does likely occur in tandem with, and under some of the same pressures as biodiversity loss (economic globalization, for example, drives both agricultural and linguistic "efficiencies" - also, as languages and species disappear, the same affective specter of homogeneity looms). And yet, while the loss of a species is a "complete" loss, native speakers live on, and "have culture" after their native languages cease to operate meaningfully as organic discourse. Many Irish people, for example, seem to imagine themselves as doing fine culturally, without Gaelic. Thus, we must be cautious in using language loss or language preservation as the only proxy for measuring the processes by which distinct societies are losing rights and access to their ancestral territories.

What can the fate of languages tell us about biodiversity loss? Languages cannot be saved in the 11th hour by bullets and barbed wire, rather, the demise of languages generally, must be located in the more difficult web of global-to-local forces that either infuse them with vitality, or render them irrelevant. In the end, the vitality of a given language is a byproduct of the political economy in which it is used, but this does not imply that a language must be dominant within a cultural context to survive. Haitian Creole, for example, was born of exclusion and resistance. It thrived on neglect, isolation and invisibility.

Like language, religious and ritual practice is a realm of cultural behavior which vectors and orients socio-ecological relations in complex and dynamic ways. As Merchant (1996), Slater (1996), Milton (1998) and others have pointed out, the modernist project of rationalizing a chaotic, unproductive and hostile wilderness has historically looked for its moral justification to Judeo-Christian concepts of dominion and restoration of a fallen Eden, a view of the world in which humans stand above, rather than within the matrix of the natural world. Within this paradigm, Eden, or ideal nature, was not a wilderness, but a garden, ordered, knowable and geared to the productive service of God and humanity. "Man's" task, in this context, was to "recover" Eden by breaking and taming the godless waste of "wild" nature. As modernity matured, and its alienations and discontents flowered, this paradigm was gradually reversed. Wilderness became sacred and modernity an overarching evil to be tamed. In both cases, however, Western humanity simultaneously imagined itself apart from and tangled-up in nature – struggling all the while to find, and morally justify its role.

In contrast, many of the peoples who encountered European modernity in its ages of conquest, expansion and development, lived cosmologies in which human and non-human nature were

neither rationally bifurcated nor internally conflicted, but were understood to be part of an integrated whole (Cronon 1996). These traditions and their adherents were variously demonized and sanctified in the West, although, as Pretty et al. (2008) make clear, these non-Western, holistic orientations to nature were certainly never uniform or static in their holism, just as European views were not entirely paternalistic, binary or exploitative. Still, the social, political and economic trajectories of colonial, post-colonial and neoliberal interaction have been and remain infused with traces of this oppositional cosmological legacy, a legacy that has underpinned modernist development and conservationist thought throughout much of the twentieth century.

While traditional, mainstream Judeo-Christian movements have to a certain extent increasingly come to rethink both their orientations to local faith traditions and to the environment in recent years, we should not think of this trend as a positivist linear evolutionary path toward religious tolerance, harmony and pluralism. Nor should we reify traditional or indigenous belief systems as static, pure or necessarily benign in their orientations to the natural world. Rather, we must recognize that in many areas of the world, religious friction and cross-fertilization continue to produce extremely dynamic, place-making political-ecological frontiers, rife with cultural ferment, conflict and resistance, and have become contexts of transformation with broad implications for both cultural and biological diversity.

Especially interesting in this context is the dynamic proliferation of Evangelical Christianity throughout much of the developing world in recent decades. Once imagined primarily as an exogenous “Western” phenomenon, and as an imposed threat to local spiritual traditions, Evangelical Christian forms have been claimed and recontextualized in myriad ways by “local” agents. This process has transformed Evangelical Christianity in fundamental ways, giving rise to new forms of endogenous practice. In many contexts, a kind of Evangelical “wild west” atmosphere now predominates, in which diverse forms of Christianity jostle and compete loudly in newly energized and dynamic public spheres. Whether or not this trend will predominantly suppress or enhance cultural and biological diversity remains to be seen, but like many of the movements we discuss, this scenario likely suggests both threat and opportunity.

In Haiti, for example, where the Catholic Church has long existed in a kind of symbiotic stand-off with Hatian Vodou – each ritually informing and in dialog with the other - a uniquely Haitian Evangelical Christianity has, especially in the countryside, reawakened old animosities, positioning itself in opposition to Vodou and in many cases working diligently to eradicate the tradition and all its “evil” influences. Meanwhile, a literal fundamentalist Christian focus on Armageddon and divine justice in the afterlife may be appealing to those for whom the age-old struggle against dominant political and economic forces has long seemed fruitless and hopeless. Thus, for some, Evangelical Christianity may diffuse social activism by providing an impetus to lay down the difficult and uncertain struggle for change in “this world” in favor of a more simple and certain victory in the next.

On the other hand, Evangelical Christian communities have, in many cases, generated new and service-rich social networks that have deepened and diversified civil society in a context where state services have long been weak or altogether absent. These networks, especially those infused with financial support from the “north,” often provide opportunities for education, clean

water, housing, technological assistance, healthcare and webs of emotional, financial and social support – all of which help to relieve pressure on a drastically over-burdened environment. At the same time, in response to Christian condemnation, adherents and outside supporters of Vodou have promoted its rich artistic (visual and musical) elements, giving it a global visibility, respectability and cachet that it never had prior to the emergence of this “threat.” While Haitian Vodou has, across innumerable generations of political upheaval and resistance, clearly shown itself to be far more durable and resilient than its opponents are likely to recognize, this “new” religious friction will likely continue to energize and transform Haitian social space in novel ways.

Integrating cultural and biological diversity in theory

A variety of conceptualizations and fields have arisen that seek to integrate across biodiversity and culture (Pretty et al. 2008). As one example, the concept of “biocultural diversity” has emerged as a way of seeing socio-ecological landscapes in more holistic terms, foregrounding the interdependence of community and place, while suggesting some of the richness with which diverse communities see, value, use and protect threatened environments (Posey 1999, Maffi 2001, Escobar 1997, 1999). However, the concept of biocultural diversity should not be understood as an unproblematic uniting of nature and culture or a simplistic overlay of intersecting geographical areas of richness in species and languages.

Rather, it references a dynamic set of socio-ecological relations across time and space in which “diverse natures” and “diverse cultures” have historically produced and continue to produce one another (Harmon 1996, 2002; Smith 2001; Maffi 2001a, b, 2005; Toledo, 2002; Carlson and Maffi 2004; Stepp et al. 2004; Loh and Harmon 2005; Cocks 2006). Moreover, as many scientists have observed, biological and cultural diversity are declining in tandem under the same global pressures, and the loss of knowledge embedded in disappearing languages and cultural practice may exacerbate the loss of species whose social meaning and value are tied to these forms (Maffi 2001b; Harmon 2002). At the same time, where biologically diverse environments have given rise to diverse adaptive responses embodied in cultural practice, the loss of biodiversity corresponds to a diminishing human vitality. Biocultural diversity, then, is less a blueprint for solving the somewhat isomorphic dilemmas of cultural and biological impoverishment than it is a framework for addressing large scale threats in a way that takes into account the interdependency of cultural and biological diversity (Dove 2005, Cocks 2006). The mapping projects and other conceptual tools that have emerged from this framework, while perhaps not adequate to capturing the complexity of local and global social processes and modes of production (c.f. Brosius 2006), have been practical aids to creating an alternative vision, enabling conservation practitioners and social rights activists alike to forge common ground.

Integrating people and biodiversity conservation in practice

The involvement of local people in biodiversity conservation management strategies have run the gamut from the most minimal or even outright exclusionary practices to locally initiated efforts (Wilshusen et al. 2002, Agrawal 2005). Non-participatory, command and control systems—what Peluso (1993) calls “coercive conservation”—where local, community, and indigenous peoples are accorded a voice, but often as more of a formality or an afterthought than a functional role

have often been less successful than systems of integrated local management (Pretty and Shah 1997; Pretty 1995; MacDonald 1995, Rahnema 1992, Ribot 1996, Nepstad et al. 2006).

In the early 1990s, conservation and development organizations turned to a suite of alternatives to the traditional protected areas strategies. These initiatives, such as Integrated Conservation and Development Projects (McShane & Wells 2004; Terborgh et al. 2002), Community Based Forest Management (Menzies 2007), Community-based Natural Resource Management (Brosius et al. 2005), extractive reserves, debt-for-nature-swaps, and others had as a common goal of engaging and incorporating community perspectives into conservation, with an emphasis on participatory, livelihood, or stakeholder-driven strategies (Brosius, Tsing and Zerner 1998, 2005; Kemf 1993; Lynch and Talbot 1995; McNeely 1995; Murphree 1999; Pye-Smith, Borrini-Feyerabend and Sandbrook 1994; Stevens 1997; Western and Wright 1994). However, serious problems arose with these efforts, perhaps because they did not start with a sound understanding of cultural and social contexts or with effective engagement of local communities. Often the participatory process began after major decisions, for instance boundaries for protected areas, had been made (Escobar 1998; O'Neill 2001; Orlove 1991; Peters 1996). Stumbling blocks occurred as well when inappropriate or incomplete sets of partners were chosen, thus empowering some “stakeholders” and disadvantaging others (Hodgson & Schroeder 2002), or when all stakeholders were treated as if they had equal access to power, resources, and experience (Walley 2004). In addition, conservation practitioners learned that managing participation in and of itself is a significant challenge, and that some stakeholders contribute more knowledge than others, so that more inclusion is not always better for a project’s efficacy or for its legitimacy (Brody 2003).

Additionally, many of the attempts to incorporate local peoples into internationally or nationally initiated conservation efforts bought into the larger “development” paradigms (c.f. Escobar, 1998). These efforts assumed that what local people “needed” or “wanted” was the formulaic better education, better health, and more access to markets. A whole host of efforts attempted to bring in these standard tools for supposedly improving quality of life, although now with a twist of initiating “conservation-compatible” strategies, such as marketing non-timber products, promoting green certified lumber, and branding organic commodities. Underlying this approach was the conceptualization of people living in and near designated protected areas as “poor” as per the Development Paradigm noted above, and as needing help to increase cash income in ways that would prevent encroachment or exploitation of protected areas (see Dove et al. 2005 for several examples). Clearly many peoples in regions targeted for conservation wanted what the Development Paradigm has to offer—as is well documented, many say that they do and are actively working to increase their share of the market economy (see Golub 2006 for an example of local communities who have embraced development, in this case in the form of mining). The processes of increased integration into market economies are complicated, however, and generate considerable debate within communities. Some individuals favor market access; others oppose it. In many instances, people want to find pathways that allow them to have sufficient time and space to control their integration, to resolve their own conflicts, and maintain political and cultural autonomy. In other instances, people who enter into contracts or agreements to exploit their natural resources (with timber extractors, oil companies, commodity producers) later come to regret these decisions (see Kimmerling, Kane, Zimmerman, etc.) In some cases, results are mixed, with some people benefiting from the projects while others do not—leading at times to increased stratification within communities.

A clear challenge in initiatives to sustain cultural practices, livelihoods and languages and to conserve biodiversity has been the fractionalization of the efforts (Redford and Brosius 2006). A missed link between cultural and biological diversity leads to difficulties in conceiving and implementing diversity efforts at decision-making, implementation, and monitoring levels. As many have pointed out, solutions will arise as we more coherently integrate efforts to protect people and the environment, and embrace the bonds between biological and cultural diversity (Edgar & Sedgwick 1999), and then seek to identify ways to incorporate that understanding into decision-making and practice, allowing for adaptive management, alternative knowledge systems and ways of perceiving (Brush 1995; Brush and Stabinsky 1996; Holling, 1978; Ringold et al., 1996; Macdonald 2003). As Escobar has argued, “the common view of distinct domains of nature and culture that can be known and managed separately from each other is no longer tenable” (1999:9).

In its characteristic emphasis on daily routines and patterns, ethnographic inquiry, without either reifying “culture” or essentializing “biodiversity” has the capacity to unpack the chaotic diversity and “difference” in environmental engagements within and among communities. It can illuminate culturally specific patterns and practices that may organically sustain biodiversity - modes of dress, habitation, religion and metaphor, concepts of the ‘right way’ to do agriculture, ethical relationships with ancestors, the maintenance of kinship-based production systems and non-market driven subsistence lifeways, and the dreams, joys and aspirations of individuals. If, following Belay et al. (2005), Maathai (2004), the work of the Compass Network and many others, we recognize that the lifeways of diverse peoples reflect ongoing processes of adaptation to unique manifestations of biodiversity (for examples see Bodmer et al. ; Olsson & Folke ; Ostrom 1990; Wade 1988), we must also recognize that these strategies and adaptations – embodied in language and practice – contain indispensable tools for understanding and preserving biodiversity. The context-specific and often creatively improvisational capacities of local land managers provide a wealth of diverse perspectives on biodiversity and conservation to complement traditional “Western” conservationist practice. This diversity of perspective and practice, more than simply supplemental to mainstream conservation efforts, is a crucial component of resilient landscapes. As Shiva and others have suggested, “monocultures of the mind,” including formulaic approaches to conservation, eventually produce monocultural environments – and monocultures of all kinds are inherently non-resilient, that is, they have less raw material with which to answer change than diverse systems (Shiva 1993; Pollan 2007; but see Brown 2006). A biocultural diversity approach, then, suggests a multiplicity of “ways of seeing” landscape and a creative profusion of socio-ecological interactions that deepen the natural adaptability of societies while diffusing the impact of extractive practice on the environment.

Although the historical record of humankind’s relations to the environment is rife with examples of over-exploitation, unsustainability, indifference and homogenization (Wolf 1997, Redman 1999, Scott 1998, Harvey 2006; Golub 2006), this record also suggests that some societies have a demonstrated capacity to endure and even flourish under external pressures, to incorporate diversity both as inherent value and resistance, and to develop systems of practice that preserve, enhance and even produce biological diversity in uniquely appropriate ways (Heckenberger et al. 2007). We aim to explore these diverse societies interact with their environments to preserve,

nurture and provide for an organic restoration of biological diversity in the face of expanding local, regional and global threats to that diversity. The case studies we present below emphasize some of the diverse responses to: How do culturally unique communities respond and adapt in the context of global capitalist markets? To what extent are threats to biological diversity also threats to cultural diversity? How do cultural practices mediate, mitigate or amplify these threats?

Rather than reifying either “indigenous” or “technical” knowledges, we recognize conservationist knowledge more broadly as an essential human value, and take the dynamics inherent in the producing of biological and cultural values as a starting point for expanding diverse approaches to conservation. We are concerned not only with sites of “wild profusion” (Lowe 2006) but also with locally-valued biodiversity in “disturbed” agricultural landscapes, including urban contexts, where people may mindfully conserve and celebrate the biological diversity they value as part of everyday cultural practice.

Within this context, local and global conservationist practice must be recognized as intertwining and complementary components, rather than elements competing for privilege. The integration of global and local conservation through active initiatives and efforts impelled by international or national agents then, is as much about legitimating and expanding the use of existing tools in a given community’s environmental toolkit as it is about integrating “western” notions of “best practice,” or raising consciousness of the embeddedness of place in systems of global flow. This may include, among other things, the revival of “lost” or endangered languages and cultural practices, the foregrounding of feminist perspectives on conservation, the facilitation of collaborative networking across spatial scales, and perhaps most importantly, the strengthening of diverse civil societies essential to the meaningful participation of local communities in both endogenous and externally imposed conservation efforts (Menziés 2006). Knowledge facilitates action and diverse knowledge produces a greater capacity for local and global communities to both respond to a changing world and to influence the direction of change.

With the greater recognition that conservation must be inclusive if it is to be a long-term endeavor, these efforts are also increasingly energized by creative tension, expanding agency and cultural ferment, where global power dynamics bring together diverse casts of actors and differently situated systems of ecological value. This diversity of vision and practice, although at times contentious and contradictory, holds great promise for sustaining biodiversity in the face of equally diverse threats to survival by facilitating the emergence of vital and dynamic communities of practice, and opening unforeseen opportunities for “conservation across difference” (Brosius 2007:21).

Common Threats to Cultural and Biological Diversity

The processes leading to the loss of biological diversity and the loss of distinct lifeways are many and varied and act across a variety of scales and regions (see for instance Bawa and Dayanandan 1997), but the potential consequences are clear – a world where mass consumption and production increasingly shape social and cultural patterns, giving the appearance of homogenization. Populations of hundreds of plants and animals are declining. Of the almost thirty thousand species listed on the IUCN’s Red List website (a small fraction of the estimated

1.5-1.8 million scientifically described species on Earth), 2.4%, or 698 species, have gone extinct, while 26.7% are considered threatened with extinction at some level (IUCN 2007). Our large-scale global agricultural systems depend on remarkably few staple crops and in consequence we are witnessing a plummeting diversity of agricultural varieties and livestock breeds (Shiva 1999, 2004). As we noted above, some languages and modes of traditional ecological knowledge are similarly in danger of extinction. More gravely, in too many places, vulnerable peoples who have survived centuries of political or economic colonization, now are experiencing massive displacement from their homelands, destruction of their habitats, and death as resource wars large and small are fought out in their terrain.

Cultural, linguistic, and biological diversity are subject to a variety of powerful and interconnected forces driving change on a global scale. An understanding of how these forces intersect can inform integration of efforts to sustain cultural and biological diversity. While recognizing that there are innumerable ways to package and discuss drivers of diversity loss, for the purposes of this working paper, we discuss four which we think are the most proximate causes of diversity loss: unsustainable resource use; economic globalization; unchecked and unplanned urban expansion; and climate change. At the global level, each indubitably drives substantial loss of cultural and biological diversity, and poses a genuine threat to fragile landscapes and to people who live in them. However, that perspective can mask the multi-faceted nature of each of these drivers, and the fact that they affect biodiversity and cultural diversity in non-uniform and non-unilateral ways. At a local level, some of these processes can represent seeds of opportunities for sustaining cultural and biological diversity, in no small measure because people and other living creatures confronting massive change find creative ways to resist the homogenizing or extinguishing forces. In presenting each of the threats, we aim to reflect this complexity by presenting both their negative consequences as well as their potential to enhance diversity.

UNSUSTAINABLE RESOURCE USE

The trajectory of the present day world economic system—capitalism—has led to an unprecedented rate of human consumption of natural resources—putting biological diversity and distinct cultures or societies at grave risk of accelerated loss. This global rise in consumption relates to the total number of people using resources, per-capita consumption, and the way in which we use resources. The Millenium Ecosystem Assessment noted that nearly two thirds of the earth's ecosystem services (the natural or "green" infrastructure that makes life possible) are degraded or used unsustainably (MEA 2005). Among the major marine capture fisheries stocks for which there is reliable data (441 species that make up roughly 80% of the total marine catch), 3 percent are underexploited, 20 percent are moderately exploited, 52 percent are fully exploited, 17 percent are over-exploited, 7 percent are depleted, and 1 percent are recovering. Of the top ten species, which account for around 30 percent of the total marine catch, 7 are either over-exploited or fully exploited (FAO 2005).

Too often, a simple relationship has been drawn between consumption of natural resources and population figures (Princen et al. 2000; also see Lambin et al. 2001 for a review and critique of theories connecting land cover change and population growth). Taken at a global level, there is an increase in resource consumption at the same time as an increase in global human population growth. When examined more closely, however, this relationship breaks down: population

growth is highest in newly industrializing or still agrarian-based countries, while resource use is growing the fastest in post-industrial and in-transition countries. Consumption in post-industrial² nations – in terms of sheer volume of products, of fossil fuels, and the amount of waste generated – is overwhelmingly higher both on a per-capita as well as an absolute basis than in industrializing nations (Guha 2006) that are now the locus of mass production of goods and commodities. Yet not only the G8, but also economies in transition like China, India, and Mexico, have markedly increased their per capita consumption as well as the number of “new consumers” entering the middle class (Myers and Kent 2004).

In a globalizing world, resource use does not always translate to an effect on the landscape directly surrounding consumers. In many post-industrial nations, reforestation is a dominant trend despite high levels of resource use. For instance, Vermont was only 35% forested in the 19th century because of the importance of sheep grazing to the local economy (Mather and Needle 1998). Subsequent to the integration of the Midwest into the national economy through railroads, sheep farming shifted to more productive regions. By the end of the 20th century, Vermont was 76% forested (Mather and Needle 1998) and the local economy is now based around provision of services. Forested landscapes have revitalized in New England despite a concomitant rise in consumption because centers for production were shifted to other parts of the country, and now the world. Thus, the region exported the negative environmental consequences of resource exploitation – first to the Midwest, and now also to other countries. New England looks “green” because they have developed structures for the affordable outsourcing of extraction to other areas of the world, so consumption patterns there look as if they have little impact when in fact they are in many cases contributing to unsustainable practices elsewhere.

Understanding the underlying drivers in the dynamics of resource use is also complex. In areas of the recently industrialized or agrarian-based world where resource production or extraction are expanding for international markets, there is often a concomitant displacement of the landless poor to the frontiers of less-disturbed ecosystems³. Here, the displaced attempt to eke out a subsistence livelihood or make desperate attempts to join the market-based economy, and are thus pushed into unsustainable forms of resource extraction. They become the visible scapegoats for widespread degradation, but their activities are only the surface indicator of a more powerful extractive force driven by the global economy. New boom and bust cycles are emerging, based on the extraction of oil and natural gas, logging for hardwoods, and the search for minerals, as well as the expansion of the agro-industrial enterprise. People who have a longer history of living in these regions find themselves also displaced and unable to maintain their subsistence-oriented

² We use the terms post-industrial, newly or recently industrialized and agrarian-based economies to reflect the current configuration of the global economic system. The shift in the nature of production, its scale, and its de-territorialization, and concomitant political and social changes leaves us with still imperfect terminologies to describe nations and geographies.

³ We recognize that even these ecosystems (e.g., what have been labeled “hinterlands” and are considered to contain some of the largest tracts of standing forests, watersheds, and other fragile landscapes) may have been historically subject to human settlement of varying degrees of intensity and to previous periods of boom and bust extraction, but we also recognize that precisely this previous pattern led to long periods of withdrawal from intense extraction, and allowed for regeneration (e.g., Fifer 1970).

lifeways. The classic and most frequently cited case is the Brazilian Amazon, where many smallholders have been pushed off their land as large-scale cattle ranching or industrial soy production has expanded because the land is convenient to transportation hubs (Fearnside 2001), but the process is occurring world-wide, and even in the post-industrial countries where the last vestiges of small farm agriculture are under assault.

In an expanding context of capital-driven resource hunger, we have witnessed myriad forms of both compliance and resistance to regimens of accumulation (Scott 1985, 1990). Although much has been made of the “compliance” or acceding of local peoples to the forces of the market economy, less is understood about the nature of resistance, and even less as to why people would continue to resist such a powerful force. Nevertheless, such is the case, and without negating in any way the constant flow of social change, we also recognize that people have held on to systems of belief, created forms of cultural identification and actively maintained practices that do not conform to capitalist economic or social structures.

GLOBALIZATION

Global trade is nothing new. In the last century, however, the pace of new market linkages has increased dramatically, aided by improvements in technologies of transportation and information. Newly or recently industrialized nations are simultaneously new markets for consumer goods, manufacturing centers for these goods, and the natural resource stores to produce them. The trend of globalization has been facilitated by the widespread adoption of capitalism as the economic system for wealth generation and the increased power of international financial institutions (e.g., the IMF and the World Bank) (Guttal 2007). Globalization is characterized by the prevalence of neoliberal economic policies and the reduced importance of the nation-state in directing economic development (Guttal 2007). Some scholars focus on how globalization is experienced, interpreted and reshaped in the developing world in diverse and creative ways (Tsing 2005; Barber 1996). Others have focused on the hegemonic and homogenizing effect of globalization (Guttal 2007, Shiva 2004). Previous reviews have treated globalization from a biodiversity and cultural perspective in more depth (Tsing 2005, Shiva 2004, Guttal 2007, Schelhas and Pfeffer 2008), so we will summarize here some key points about how globalization affects biodiversity and cultures and how globalization affects efforts to sustain biological and cultural diversity.

Economic globalization causes increased and more homogenous global consumption patterns. This is driven by the increased activity of transnational corporations in newly industrializing countries, both for manufacturing goods and for marketing their products to the new consumers. Increasingly, natural resources are extracted from one country, processed in another, and sold around the world, with favorable policy environments being the main determinant of where these different activities take place.

The reduced barriers to international trade mean that products from halfway around the world can cost less than those from down the road, leading to widespread shifts in production and more volatile booms and busts in prices. Although it is not universal, there is a shift to importing certain agricultural products and a shift to export-oriented agricultural production, sometimes in the same country. With this shift to long-traveling agricultural products many argue that we are not only reducing each nation’s food security, but we are also reducing the overall quality of our

food (Martí & Pimbert 2007; Shiva 2004). The ecological effects include greenhouse gas emissions due to transportation as well as pollution due to increased use of agricultural inputs for industrialized agriculture. Culturally, the social systems that have maintained our food systems for millennia are becoming compromised as local farmers cannot find markets for their products. The loss of agrobiodiversity is another effect of the widespread industrialization of agriculture for the global market (Shiva 2004). Similarly, as nations compete to participate in global markets, they increasingly promote the language of commerce, often a foreign language, at the expense of local languages and even of bi-or multi-lingualism.

Increased virtual communication modes can also augment unsustainable traffic in wild products. A recent study by TRAFFIC showed that Chinese-language internet sites in mainland China, Hong Kong, and Taiwan, including international auction sites like Yahoo and eBay and wildlife trade websites, market products containing threatened species such as elephants, rhinoceroses, tigers, and marine turtles that are protected under international conventions (Wu 2007).

On a related issue, expatriates who have migrated to other countries may take advantage of internet and other market opportunities to gain access to traditional medicines whose use may be in decline in their home country. While in China people may be starting to embrace popular mass-produced pharmaceuticals (Von Hippel et al. 2005; but see also Zhang 2006), in some cases individuals of Chinese heritage living in the United States appear to use traditional medicinal products more frequently than people in China (Lee et al. 1998).

While globalization is often figured only as increased market linkages, it also entails the increased spread of ideas and information internationally. For efforts to defend cultures and conserve biodiversity, this has translated into an opportunity (Schelhas and Pfeffer 2008; Rodriguez et al. 2007). For example, the rubber tappers movement in Brazil was able to achieve their goal of defending their land tenure and their livelihoods by capturing international media attention and framing their struggle in global environmental and human rights terms (Allegretti 1990, 1999). Similarly, with languages for which there are few remaining speakers, spatial separations that formerly were barriers to sustained communication are now crossed by telephone and internet connections, facilitating and maintaining use of the languages.

In addition, the increase of lands under some form of protection can be attributed to globalization (Schelhas and Pfeffer 2008). Scholars sometimes frame this as an imposition of exogenous values. In certain instances, this is no doubt the case, and the formation of protected areas translates to dispossession and marginalization of people (Schmidt-Soltau and Brockington 2007; West et al. 2006). In other cases, however, the designation of protected areas has been at the behest of local people in order to protect against dispossession by more powerful social actors.

The global market has also enabled some incentive schemes that promote market-driven production have the potential to protect ecological and social values. Shade-grown coffee (Perfecto et al. 2005) and forest stewardship council certified timber are some examples. However, no certification scheme perfectly creates incentives that sustain biodiversity and local people and their ways of life. Certification systems can sometimes create unexpected outcomes, and often they are not powerful enough to generate widespread shifts in production strategies or practices. For example, the organic food movement began in response to the negative social and

ecological effects of large-scale industrial agriculture. The roots of the organic food movement were in small community-supported agriculture schemes (including farmer's markets and boxed produce distribution), a system that emphasized the value of face-to-face interactions and place-based knowledge (Raynolds 2004). With the growth of mainstream interest in organic food due to consumer health concerns about conventional produce, local producers alone could not meet the demand, and larger producers and distributors saw an opportunity for growth. This translated to a globalization of organic food certification standards and the establishment of large-scale organic food production in the developing world, mostly for provisioning counter-seasonal produce as well as certain specialty products, such as coffee. The global organic certification standards favor large-scale producers in the developing world. The high transaction costs of attaining and maintaining certification exclude smallholder farmers, whose farming practices often already comply with organic standards. Thus, the globalization of organic food certification, while upholding the core values of reducing agricultural inputs, has prevented a market-based mechanism from upholding the social values of the original movement (Raynolds 2004). This inadvertent exclusion of developing country small producers from the certified market for their products has also been shown in the timber industry and fisheries (Cashore et al. 2003, Ponte 2008). One solution is for small farmers to join forces; farmer cooperatives in Latin America have enabled small-scale coffee producers to overcome the transaction costs of certification and achieve economies of scale in certification (Raynolds 2004).

URBANIZATION

The pace and scale of urbanization has steadily increased since the end of WWII. Today, more than half of the world's human population lives in urban centers; it is estimated that by 2030, 60% of the population will be urban dwellers. In 2000, urban areas in Latin America contained 75% of the region's population, a comparable distribution to North America (Cohen 2004). What does this mean for biodiversity and what does this mean for cultures? For both, the prognosis is not straightforwardly negative, although the general trend is not positive. For ecological systems, the conversion of wildlands to unplanned or uncontrolled urban expansion constitutes a loss of habitat for plants and animals. In addition, the large-scale covering of the Earth's surface with impermeable substances (i.e., tarmac and concrete) causes changes in the recharge rate of underground aquifers and in the flow regime of rivers, including increased frequency of flooding and drought (Mills 2007). Urban centers can also be centers of pollution, due to effluent and the products of combustion (Mills 2007), both of which have negative consequences for human health and natural systems.

The increased pace of urbanization has been accompanied by the growth of inequality. Many people who have migrated into urban areas have left agrarian or pastoral homelands where there was some control over sources of livelihood for a more emmiserated life in urban areas. The urban poor lack access to basic services and are subject to greater environmental pollution. At the other end, the wealthy, and extremely wealthy urbanites are engaged in increasing levels of consumption of commodities (Myers and Kent 2004; Davis 2006). More reachable as markets because of population density and access to information technology, urban consumers drive demand for ever higher extraction of natural resources, and a global commodification of wild

species (e.g. shark fins, tiger skins, game meat, ocean and river fish). Fashion trends and fads spread globally through urban areas connected by virtual and physical flows of information.

The resource needs of increasing numbers of people living in urban areas are different and greater than those in rural areas. Living in cities exposes urbanites to more consumer goods, advertising, and marketing, which increase per capita consumption. In addition, the increased numbers of people who live in cities affect the regions surrounding cities. Many peri-urban areas convert to producing food for urban markets rather than local subsistence, potentially intensifying agriculture (Keys & McConnell 2005).

As rural areas experience loss of population, the social fabric of life becomes frayed. The spread of information and urban-centric world views and aesthetics has led to the de-valuation of local, rural ways of knowing and thinking. For rural areas, the decline in population, and especially the decline in certain demographic groups (those heavily recruited into urban-based work or into heavy extractive industries—men and the young), can mean that certain traditional communal labor practices (such as maintenance of irrigation systems) are abandoned due to dearth of labor. For example, revival of traditional irrigation water user associations in Bulgaria has been hampered by the length of Soviet centralized control of irrigation systems and by the large-scale migration to cities (Theesfeld & Boevsky 2005). In urban areas, loss of knowledge about agro-diversity, and habitat diversity is rapid. If no one is planting corn in urban areas, why teach the children the rituals and songs associated with sowing or harvest? Children of urban migrants do not possess the traditional ecological knowledge and do not engage in the same cultural practices as their parents (Belay et al. 2005). Those who stay in rural areas find themselves questioning their own ways of life, and pushing their children into educational systems that systematically erase local ecological and technological knowledge bases and languages. In fact, there has been a great blurring of lines between the rural and the urban, which stretches beyond geographical terrain to imagined realms.

Maintenance of languages, cultural forms, and practices is deeply linked to traditional forms of livelihood, many of which are difficult to continue to follow in the urban context. Speakers of indigenous languages who are still involved in subsistence activities often have higher levels of TEK that is more evenly distributed across age groups in comparison with mestizo and Spanish-speaking indigenous populations (in Mexico – Benz et al. 2000; in Bolivia - Reyes-García et al. 2005; and in Venezuela - Zent 1999, 2001). However, different Native American populations still speaking indigenous languages as their first language show varied patterns of TEK retention. Children of the Tohono O’odham of Southwestern United States exhibited significantly less familiarity with names of common plants and animals than their grandparents (Nabhan 1998), while Seri Indian children of Sonora, Mexico had equivalent knowledge to their elders (Rosenberg 1998). The difference may stem from the fact that Seri children still engage in traditional subsistence activities whereas Tohono O’odham spend more time in formal schooling and in watching television. Traditional environmental language may thus be lost first in situations of language shift as a response to radical cultural and ecological change such as urbanization (Zent In Press).

Furthermore, the likelihood of rural land conversion to environmentally less-benign use is higher in the absence of a vibrant rural population, particularly those with clear land tenure. For

example, with the loss of small family farms in the United States and the concomitant loss of population, larger and larger tracts of fertile land are being converted to agro-industrial production or taken over by urban sprawl. In the Amazon, satellite imaging and mapping reveals a direct link between greater expanses of deforestation in areas where smallholders or indigenous people have no clear title as compared to lands managed by indigenous people with unambiguous title or land security (Nepstad et al. 2006).

Although in these ways, accelerated urbanization contributes to the loss of biological and cultural diversity, it is not always a threat. Urbanization has itself led to the proliferation of diverse cultural forms and practices as people interact in urban settings, borrowing and melding customs, aesthetics, and social patterns. New forms of aesthetic expression emerge, new solutions are devised for everyday problems, and new belief systems can take root. The concentration of people in urban centers provides a means to enable greater access to basic services (water, electricity, health, education, transportation) in a more efficient manner, lowering the human footprint on the planet. Preventing urban sprawl through better planning and smarter growth can create spaces for wilderness contiguous to urban areas, enhancing the protection for other species. Some cities are starting to embrace the concept of circular metabolisms – the cycling and recycling of water, food, fuels, and other materials – in urban environments through initiatives such as sustainable building design, working with wetlands to redirect storm water and help filter rainwater (Emerton et al. 1999, Emerton and Bos 2004) , and other systems. The threat then, is not urbanization per se, but rather the unequal and unstable social structure that precludes a more rational or sustainable form of urban life and the unsustainable planning that is currently taking place in many of our largest cities.

CLIMATE CHANGE

Global climate change induced by increased industrial activity is one of the greatest challenges facing the world today. It is a global phenomenon that manifests its impact on humans, plants, and animals at a local level. In February 2007 the Intergovernmental Panel on Climate Change (IPCC) released its Fourth Assessment Report (IPCC 2007). This report, with its observations of increases in global average air and ocean temperatures, widespread melting of snow and ice, rising global mean sea level, regional changes in precipitation patterns, and variations in extreme weather, presents unequivocal evidence that the Earth's climate is changing. Global atmospheric concentrations of carbon dioxide, methane, and nitrous oxide have increased markedly as a result of human activities since 1750 and now far exceed pre-industrial levels. In its report, the IPCC indicates that most of the observed increase in globally averaged temperatures since the mid-20th century is very likely due to the observed increase in anthropogenic greenhouse gas concentrations. Over the next two decades, a global average warming of about 0.2°C per decade is projected for a range of emissions scenarios, and continued greenhouse gas emissions at or above current rates will cause further warming and induce many changes in the global climate system during the 21st century that would almost certainly be larger than those observed during the 20th century.

People and environments across the world react in different ways to climate change (Parmesan (2006) Walther et al. (2002); Lovejoy and Hannah (2005). Scientists and local community members are tracking existing changes and extrapolating potential effects on populations of

plants and animals, which respond to changing weather regimes by altering home ranges (upward and poleward shifts), colonizing new areas, changing timing of reproduction, or going extinct. Increased susceptibility to disease is another manifestation of climate change on species. Documented species-level changes include 1) earlier reproduction times in many species, for instance plants in Japan and North America, butterflies in the United Kingdom, Spain, and California, frogs in North America, and birds in North America and Europe and 2) poleward shifts in range and/or shifts towards higher elevations in penguins, birds, and dragonflies/damselflies. The reduced connectivity of the Earth's landscapes means that it will be more difficult for plants and animals to disperse (especially when roads and other human landscape modifications are barriers for dispersal) than it has been in the past. Scientists are also documenting broken links between co-evolved species; 60 percent of the interactions in multi-species studies were disrupted as species adapted differently to the impact of climate change. Coral bleaching is one well-documented example of how climate change can affect co-evolved species (Wilkinson and Souter 2008).

Fewer data exist on the effects of climate change on humans, but changing climate will certainly affect agriculture (see (Rosenzweig & Parry 1994). In some cases it may be economically beneficial, leading to a longer growing season, for example. In others, it may cause major economic losses due to crop failures. Rising salt waters and unpredictable weather will further exacerbate problems by causing property destruction and altering available freshwater resources. Insurance companies (and particularly re-insurance companies) are struggling to understand and predict these effects. Furthermore, global climate change is occurring within the social context of rising inequality, as described above. Both rural populations and the urban poor are the ones most likely to be affected by incremental and massive ecosystem change. An iconic example here is the unequal impact of Hurricane Katrina, whose intensity has been attributed to warmer ocean currents resulting from climate change processes. Katrina's destruction of the urban infrastructure in the Gulf Coast was no match for the social destruction that ensued and revealed the brittleness of our ability to respond humanely to such disasters.

Climate change can also affect human health (see (Patz et al. 2005) as well as cultural practices and livelihoods, changing how people traditionally get food or build houses and threatening integral characteristics of sacred spaces. The cultivation of wine in France depends upon a system of "*appellation*" that is linked to cultural and regional identification with specific grape varieties, many of which would be impacted by changes in temperature and growing season length, particularly in southern France (Tate 2001; Jones et al. 2005).

People inhabiting economically and politically marginal areas that are often in fragile ecosystems are also at risk (IPCC 2001, 2007; Diffenbaugh 2007). For example, in the U.S., more than half of Native Americans lives on or adjacent to reservations, where they undertake a combination of traditional subsistence activities, supplemented by labor for wages. The economies of reservations in the U.S. are based on activities such as tourism, forestry and subsistence agriculture, which are closely tied to the natural resource base (NAST 2001). Negative effects of climate change for indigenous communities are not limited to food supply and livelihoods; the changing climate is also expected to directly alter susceptibility to diseases and indirectly affect epidemiology through environmental conditions such as precipitation and temperature (IPCC 2001, NAST 2001, Green 2006).

Indigenous communities often have adaptation strategies inherent to their cultures, based on a long cultural history of adapting to environmental change. The challenge will rise as projected climate change and its effects will be greater than any changes they have previously experienced.

While indigenous people inhabiting arctic to desert environs are all challenged by climate change, the effects of climate change may be particularly acute for indigenous peoples living at high latitudes. Communities in northern Canada and Alaska have already documented changes in sea and lake ice, loss of forest resources, changes in prey populations, and increased risk to coastal infrastructure (Lee et al. 2000; Weladji and Holand 2003; NAST 2001; CCME 2003; ACIA 2005; Ford 2007; Lambden et al. 2007). These communities face the threat of melting ice and permafrost, jeopardizing their hunting and fishing customs as well as travel and shelters (Ford 2005; Huntington and Fox 2005; McBean et al. 2005). The effects of climate change on these populations are most obvious because of the rate of warming in the arctic, and models predict that future changes will be experienced earlier and more severely in polar regions than elsewhere in the world (Katsov and Kallen 2005).

Higher altitudes are another area where climate change effects on people and biodiversity are readily apparent. Scientists and local communities first noticed the effects of climate change as they tracked the retreat of glaciers and tree lines and alpine plants. Highland communities who depend on these montane species will be heavily affected. The potential impact of climate change on deserts is harder to predict, but desert-dwelling people will undoubtedly face critical changes to their lifestyles and livelihoods as the herders in the Kalahari Desert already show. Forest environments and the people and other biodiversity that depend on them face droughts, crop failures and more intense forest fires as the climate changes. Island systems and peoples are particularly vulnerable to climate change effects such as increased temperatures and sea level rise, changes in ocean currents, and more intense storms, in addition to drought and other changes found elsewhere.

There are three main options in community response to climate change (Salick and Byg 2007) – reactive actions, which entail waiting until a problem arises and then determine a solution; proactive actions, where people anticipate problems and develop alternative scenarios to avoid the problem; and no action. Example actions include migration/moving homes and communities, changing timing or location of specific activities such as hunting, fishing, and farming; setting up larger networks for exchange with other groups; water conservation techniques to help buffer against unpredictability in availability of water; changes in irrigation techniques; changes in types of crops grown; and diversifying resource bases in general, relying on a suite of varieties and species rather than just a few.

One problem communities face in investing in proactive solutions is the uncertainty of forecasts - climate change is notoriously difficult to model and react to because it is not easy to predict changes in population sizes, dry season timing, amount of rainfall, and yet all of these drastically affect success of different agricultural choices, for example. Efforts such as the Arctic Climate Impact Assessment (2005), which was prepared by more than 300 participants from 15 countries and includes many examples of the local traditional knowledge of Inuit, Sami, Athabaskans, Gwich'in, Aleut and other Arctic Indigenous Peoples, have demonstrated the value of bringing

diverse groups together to frame and address the common problems related to climate change. The next steps in understanding climate change and its effects on humans and biodiversity will be to understand the feedback loops in adaptation by humans and how that affects biodiversity and vice versa.

Another wrinkle in dealing with climate change is the policy mechanisms that the international community is developing to minimize future climate change. For example, the clean development mechanisms under the Kyoto Protocol offer an opportunity for countries that have standing forests to benefit financially by selling carbon credits under the rubric of Reduced Emissions from Deforestation and Degradation (REDD) (Parker et al. 2008). While the money that will come from the sale of REDD carbon credits represent opportunities that can empower local people and benefit them, there are numerous complications. Enforcement, access, and fund distribution are all aspects of a REDD carbon credit system where local people could lose out. Given power inequalities, local landholders are not likely to gain access to these global systems without an intermediary. Intermediaries can act in a way to empower and serve local interests, but can also act to strong-arm locals or shortchange the deliberation time. Since REDD is still in its infancy, only time will tell if it will be a force to empower or sideline local people.

Best Practices in Sustaining Diversity

As we have discussed, the issues involved in sustaining biological and cultural diversity are complicated. However, there are many current examples of efforts and initiatives that are forging new pathways in environmental conservation and conservation-compatible resource use or management that contributes to sustainable quality of life for people living in highly biodiverse habitats. An important contribution has been made by those who have attempted to synthesize what we know about both the existing status of biological diversity and cultural diversity, and of places where local peoples have retained some degree of control over their natural resources and their ability to determine their own mode of livelihood. What is clear from reviewing these cases is that no single approach is necessarily more effective than any other. In fact, in every instance, the approach must be customized to meet local conditions. Every landscape is the product of a specific evolutionary and cultural history. It may seem obvious, but sustaining diversity requires diversity in method, in partnerships, and in practices. As Menzies (2007:192) states: “each forest and each community is the product of a unique ecology and history, [thus] predicting the specific outcomes of any particular model of CBFM is likely to be little more than speculation.” Looking across these efforts and practices, we can however extract both some basic principles that can guide further work and provide a framework for determining effective strategies. In this section we organize a non-comprehensive review of case studies that illuminate these principles and demonstrate the potential of conservation strategies.

The Menzies Conditions Nicholas Menzies, in his excellent review of CBFM initiatives and efforts (2007), summarizes seven “conditions” that favor community management of forests. These conditions, in fact, can be broadly applied to more general conservation strategies. His conditions (encapsulated and minimally modified here) are: 1) Legitimacy for management institutions is attained through construction of local norms which can balance the plurality of interests; 2) Decision-making authority resides with local people such that they share in the

benefits of conservation, commensurate with the responsibility they assume; 3) Access to appropriate technology, knowledge, and skills is available for managing resources; 4) Local communities can choose their partners and opt out of partnerships, thus fostering accountability between the parties; 5) Partners must transcend sectoral interests and resist solely advancing their own agendas; 6) Local communities are enabled and empowered to access wider networks of social and political support; and 7) Local access and use rights are embedded in formal governance and legal systems such that communities can police (or summon police) to enforce rules and norms.

Although it is difficult to find cases where all seven conditions have been operative, even cases where some combinations of these are evident appear to offer local progress toward sustainable resource management and improved quality of life.

Menzies provides a wealth of case studies from community forestry experiences across the globe. Additional examples come from the work of Compas, a collaborative network of development organizations in 11 different countries (www.compasnet.org), supported by the Netherlands. Its publication, *Learning Endogenous Development* (2007), documents the work of local communities and organizations to sustain distinct lifestyles, cultural practices and manage local resources in a wide variety of settings and geographies (Compas 2007). Yet other examples can be found in the Ford Foundation's publication, *Sustainable Solutions* (2002). As the Ford report states: "The global movement for social equity, environmental justice, and sustainable development is growing" (Ford 2002).

Some recent cases come from "reports from the field" submitted by our sub-group of the conference and their collaborators. We summarize these below.

Urban Endogenous Conservation

- Michelle Cocks and Tony Dold report on their study of urbanites in South Africa, among Xhosa migrants who have retained cultural practices and use of wild plants, for both food and remedies (see Appendix 1). As they point out, there is a significant flow of both plants and knowledge from rural "homelands" to urban centers. Their work reveals the need to be wary of facile dichotomies such as "urban" and "rural." Wali has observed a similar phenomenon in the city of Iquitos, a major Amazonian gateway in Peru. Here, in the Iquitos market, there is a whole section devoted to herbal remedies, which have become immensely popular. Urbanites are familiar with these plants and also with stories or myths associated with the wilderness. In fact, urbanites have extensive kinship and acquaintance networks in the rural areas, living along the Amazon and its tributaries. While the category "urban" seems relatively unproblematic, new research suggests that many urban and peri-urban families maintain multiple residences in the city and the country, with the rural area serving as a safety net and the urban area serving as a means to access services from the government, such as secondary education for children, or pension checks (Padoch et al. 2008, Stoian 2005). These river networks are thoroughfares for small-scale barter economies where exchange occurs between urban manufactured or processed goods (e.g. clothes, kerosene, ammunition, sugar, salt, soap, etc.) and wild and cultivated rural commodities (e.g. wild game, fish, herbs/plants, handcrafts, etc). Of course, the rivers also act as conduits for more destructive extraction, but here again,

information flow among urban small-scale merchants and rural populations creates a potential community of resistance to larger stakeholders.

- In Chicago, Ross reports on Chicago Wilderness (CW), a coalition of over 260 civic institutions, city, county and federal agencies, and grass-roots organizations. CW has developed a “green infrastructure vision” for the region which contemplates a regional approach to conservation that creates a mosaic of protected areas (in County Forest Preserves, State and National Parks) buffered by land-use planning that protects watersheds and riverine systems, prevents urban sprawl, and maintains open space and recreation-use parks for a 1.8 million-acre expanse from Southern Wisconsin to Northern Indiana (Dreher 2004). In order to help facilitate implementation of that vision, Hirsch reports that the Field Museum has initiated a new initiative called New Allies for Nature and Culture (www.fieldmuseum.org/newallies), which aims to convene organizations, community leaders and institutions working on economic and social justice concerns at neighborhood or city-wide levels with environmental organizations working on local and regional conservation. CW has recognized that its current constituent base is insufficient to build either the political or civic will to implement the green infrastructure vision and that it must diversify both the base and the focus so that it is more inclusive of the region’s demographic and of concerns about quality of life. One of its major initiatives, *Leave No Child Inside* (LNCI - c.f. Ross, 2008—“Leave No Child Inside”, in *In The Field, ...*) connects the issues of children’s lack of exposure to the outdoors with salient issues of child health, urban safety, and leisure time use. Recently, Hirsch and Ross facilitated a meeting for the LNCI initiative of over 40 community-based organizations from low-income neighborhoods and communities of color. Here, participants provided input into the most effective strategies to engage their communities in addressing childrens’ connection to nature.
- NYC – The Sustainable South Bronx initiative, founded in 2001 by South Bronx resident Dr. Majora Carter, addresses environmental justice through innovative, economically sustainable projects developed in response to community needs. Projects focus on land use, energy, transportation, water and waste policy, and education to advance economic and environmental health of the South Bronx. An example of a project is the reclamation of a toxic site as a community greenspace.
- Los Angeles – Communities for a Better Environment (CBE). Bypassing state and federal air pollution monitoring regimes, which routinely overlook or downplay urban pollution hot spots for economic or other reasons – some local communities have taken air quality monitoring into their own hands. Using affordable test kits made from modified 5 gallon buckets, CBE members monitor their own neighborhoods and then present findings to state and federal agencies charged with enforcement – (<http://www.cbecal.org/>)
- A very important initiative is the Regional Equity effort funded in part by The Ford Foundation (c.f. Pastor et al. “Edging Toward Regional Equity). This endeavor contemplates a growing effort on the part of some cities (for example Los Angeles and Detroit) to begin shifting the focus away from fragmented local initiatives to mitigate the harsh impacts of racial and economic inequality toward a more concerted, unified approach to regional quality of life that encompasses environmental justice and sustainable natural resource management.

- Other urban cases come from a newly emerging literature on urban wilderness, and the ways in which residents are creating, nurturing and maintaining wilderness areas in their midst, and/or reducing urban sprawl to maintain green spaces in surrounding regions. The Brazilian city of Curitiba, for example, is becoming known for its public transportation system and urban plan that has controlled urban sprawl, affording protection of surrounding regional habitats (McKibben 1999); The Bay Area Alliance for Sustainable Development works to integrate just solutions for inner city residents with control of urban sprawl and other green initiatives (van Gelder 1999); Other cities are also combining programs for city revitalization with green initiatives (Anthony 2005). In New York, previously abandoned lots and empty spaces are being turned into “wilderness habitats” (Strand 2008).
 - NYC - Green Guerillas blends education, organizing, and advocacy to help people in New York City cultivate community gardens, sustain grass roots groups and coalitions, and address issues critical to their gardens (c.f. greenguerillas.org).
 - Center for a New American Dream. This is a supra urban initiative – people in different cities working together to drive markets with coordinating purchases. The Responsible Purchasing Network (RPN) of the Center for a New American Dream is a national network of procurement-related professionals dedicated to socially responsible and environmentally sustainable purchasing. They promote and practice responsible purchasing by identifying best practices, developing effective purchasing tools, educating the market, and using their collective purchasing power to maximize environmental stewardship, protect human health, and support local and global sustainability. The Responsible Purchasing Network is committed to leveraging the power of responsible procurement to conserve resources, mitigate pollution and waste, and promote a healthy economy. Conventional institutional procurement of products and services throughout the United States often results in extensive negative impacts on public health and the environment. They identify, use and disseminate standards and practices that minimize or eliminate destructive impacts without compromising performance or cost-effectiveness.

Endogenous Conservation in agro-pastoral landscapes

- Michael Christie from Charles Darwin University in Northern Australia reports about the Indigenous Knowledge and Resource Management in Northern Australia initiative (www.cdu.au/ik). This project uses computer databases and visual methodologies to create both research and knowledge maintenance and promulgation programs with Aboriginal nations in Northern Australia. It links an impressive array of institutions, individuals, and communities in a mosaic of activities driven by Aboriginal peoples efforts to continue language and cultural vitality.
- A Peruvian Non-Governmental Organization, ARAA-Choba Choba, based in Tarapoto has been documenting the ways in which small scale farmers and horticulturalists of the Huallaga Valley and in the surrounding regions, at the intersection of the Amazon and the Andes, have been recuperating ancient “seed pathways”—trading seeds and plants across this inter-ethnic zone, to fortify crop diversity (Choba-Choba, 2007). Here, the seed

exchanges are accompanied by knowledge exchanges and often embedded in rituals, festivals and other events. The practice of communal mutual aid helps to build supportive networks for the farmers engaged in maintaining cultural and agricultural practices that do not rely on market-related products. In this region, there has been a revitalization of sorts of reclaiming of indigenous roots—the Quichua Lamista language and heritage. A small organization, SEPKA, which started with about 7 communities about five years ago (to represent those that are not recognized as indigenous communities by the National Government) now has 70 inscribed member communities.

Conservation activities adjacent to protected areas in tropical forests of high biodiversity value

- The Field Museum’s Environment, Culture and Conservation (ECCo) Division over the past eight years has been engaged in work in Amazonia and the Andean foothills. Wali reports that they have been developing methodologies designed to identify local social assets (organizational strengths, local ecological knowledge, cultural practices and belief systems) and build empowerment strategies that take advantage of these assets. ECCo has an inter-disciplinary team with long experience working in the neo-tropics. They are carefully integrating efforts for protection of high value biologically diverse landscapes with programs designed to promote social equity and sustainable quality of life for local peoples in the environs of the protected areas that they have helped to create through the Rapid Inventory Program (c.f. www.fieldmuseum.org – search for Rapid Biological Inventory). This has led ECCo and its local collaborators to unite large-scale conservation (through nationally or regionally recognized areas) with local conservation that reflects the centuries of accumulated knowledge of indigenous and traditional peoples who have inhabited Amazonia and the Andean foothills. ECCo staff work in collaboration with local partners, including Conservation Organizations, Indigenous Organizations, and NGOs advocating for indigenous rights.

In the buffer-zone of Cordillera Azul National Park, for example, ECCo and its partner NGOs, CIMA-Cordillera Azul and ARAA Choba-Choba have been working with to develop and implement land-use plans and livelihood strategies that can lead to long-term protection of the communities’ subsistence base, and conservation of the Park. The process starts with a participatory “mapping of social assets and local resource use” that helps identify communal social patterns, sense of identity, and perceptions of place as well as local ecological knowledge and use. The initial asset mapping conducted in 2003, with 53 communities, led to a Park zoning plan that permitted adjacent communities to continue subsistence based hunting and fishing in the Park, encouraged and validated community strategies for defense of their lands, and provided opportunities for inter-cultural exchange among the Park’s neighbors (del Campo and Wali, 2007; Gavin, Wali and Vasquez, 2008).

- An ECCo partner, CEDIA (Centro de Desarrollo Indigena del Amazonia) reports on the work they are doing with the Matses indigenous community in Northern Peru. The Matses (known in the literature as the Mayaruna), who were semi-nomadic and live on the Brazilian-Peruvian frontier, first settled down into sedentary villages in the late 1960s after contact with missionaries from the Summer Institute of Linguistics. In the mid-

1970s, the Peruvian military bombed a group of Matses as they were crossing the border. In recognition of the horrific act, the Government gave title to the Matses of close to 45,000 hectares of contiguous land--- the largest single native title granted in Peru. The Matses, since the 1980s, have petitioned the government for expansion of this land, which they consider part of their ancestral territory in Peru. At the request of CEDIA and the Matses leadership, ECCo conducted a rapid inventory there in 2005. Matses men and women participated in all aspects of the inventory (biological and social), and helped develop the recommendations, which included support for their claim, and indeed expanded the requested amount that should be under their control. The Matses, at that time, were being solicited by an individual who was working with the World Wildlife Fund, to create a managed forest reserve for the purpose of timber extraction. When they realized what this would entail, the Matses, in a large assembly of delegates from all their communities, rejected the WWF plan. Currently, they are in the process of developing their own norms for use of the resources in the proposed communal reserve and also for developing a system for protection of the reserve from encroaching illegal logging operations (Calixto et.al., 2006; Berardi et al.; L. Calixto, personal communication, 2007).

Conclusion

To conclude, as demonstrated from the examples above, there are literally hundreds of small and medium scale experiments and initiatives occurring around the world to find diverse ways to maintain cultural autonomy, sustain conservation of wilderness areas, and manage natural resources with lower impact to prevent degradation of fragile ecosystems. All of these efforts have their complexities and struggles and are vulnerable to pressure from a relentless global economy desperate for fuel for its production/consumption engines. Although largely invisible and unheralded as well as local in extent, they signal the possibilities for deep-rooted change in thinking and practice in how humanity cares for the planet.

Huge challenges lie ahead. It is difficult to make a case for privileging these small-scale efforts or to find ways to make them replicable in order to expand their space, when criteria for “success” are difficult to establish, and funding is thereby difficult to obtain. Although there has been severe criticism of international conservation organizations for their funding strategies (such as partnering with large corporations, etc.), we must recognize that without financing for either local or global conservation, the efforts we have highlighted here will face even greater hurdles and barriers.

Another challenge is the formation of partnerships between large or external organizations and local peoples and their organizations (Vermeulen and Sheil 2007a, 2007b, Robinson 2007, Mavhunga 2007). Much of the literature has focused on critique of the large-scale organizations and their heavy-handedness and unequal imposition of power in the decision-making processes. Critique can be useful if it can lead to changes in practice, but we also need more concrete suggestions and methodologies for creating more effective partnerships, and ultimately for creating coalitions, and indeed social movements that will bring people together to confront the threats outlined in this paper.

Policy recommendations

In addition to Menzies' seven main conditions for effective management,

1) Legitimacy for management institutions is attained through construction of local norms which can balance the plurality of interests; 2) Decision-making authority resides with local people such that they share in the benefits of conservation, commensurate with the responsibility they assume; 3) Access to appropriate technology, knowledge, and skills is available for managing resources; 4) Local communities can choose their partners and opt out of partnerships, thus fostering accountability between the parties; 5) Partners must transcend sectoral interests and resist solely advancing their own agendas; 6) Local communities are enabled and empowered to access wider networks of social and political support; and 7) Local access and use rights are embedded in formal governance and legal systems such that communities can police (or summon police) to enforce rules and norms.

We have developed a suite of further recommendations for integrating across scales and disciplines:

- **Work to span across scales without losing the local voices/complexity when we are scaling up or the global context when we are working at the local level.**
 - Do not be afraid to experiment with different ways of integrating across scale, as not everything will work. Maintain flexibility as developing partnerships.
 - Ensure that community-based institutions are nested within a network of institutions that can address problems across scales from local to international (Ostrom 1990, 2005).
 - Facilitate creation of peer-peer networks (Compas) and communities of practice across local groups and systems of co-management between local, regional, or national entities. local communities to define common goals (Wenger 1998).
 - Ensure that agreements are contingent and that all parties have the power and the know-how to break the agreement or change the terms of the agreement.

- **Recognize the importance of integrating indigenous/local participation and knowledge across initiatives, including planning, research, implementation, monitoring, and policy and other decision-making activities** ((Berkes 2002) Colchester 1994, 2000; Colfer & Soedjito 1996; Colfer, Peluso & Chin 1997; Berkes 2004; Scheil and Lawrence 2004).
 - Expand our definitions of knowledge and recognize the need for contextual knowledge, knowledge production, and the historical context for current practices (Heckinberger et al. 2007).
 - Avoid representation of indigenous knowledge through the lens of western scientific rationales (Agrawal 1995).
 - Recognize the challenge of managing diverse partnerships; budget time and personnel to maintaining collaborations.

- **Recognize in conservation efforts the interrelationship between urban and rural areas and the increasingly hybrid landscapes at their interface.**
 - Recognize that environments that reflect strong human footprints are no less natural or less worthy of conservation action than those determined to have little impact by humans. The value of any landscape is necessarily determined by the people that have an interest in it, whether that value comes from the landscape's potential to sustain biodiversity and lifeways, to redress injustice, or to contribute to economic growth.

- **Re-define measures of human well-being and “poverty” at the global policy level.**
 - Move away from single-stranded economic development approaches that privilege inevitable integration into market economies;
 - Adopt a more cautionary approach to such instruments as “certification”, “fair trade,” etc. such that these do not provoke homogenization but allow for local flexibility and local autonomy in natural resource management.

APPENDIX: CASE STUDY

THE SIGNIFICANCE OF NATURAL RESOURCES TO URBAN HOUSEHOLDS: IMPLICATIONS FOR BIO-CULTURAL DIVERSITY

Michelle Cocks and Anthony Dold

Introduction

To date most of the examples illustrating the link between biological diversity and cultural diversity refer to more “exotic” groups of indigenous peoples. Little acknowledgement has been given to the importance of the environment and its resources to communities whose lifestyles have been affected and transformed by modernization. For example, South Africa represents a country that has witnessed 46 years of turbulent political history during which time the state forcibly moved more than 3.5 million people into “homelands” which were established under the apartheid regime. Consequently local communities seldom represent people who have historical continuity with pre-colonial societies. In contrast they are completely integrated into the national economy and as a result draw heavily on livelihoods generated from urban areas and/or State benefits such as pensions and grants. For example, the average number of monthly social grant beneficiaries in 2007 was 10 961 931 with an average per capita monthly payment of R903 (Kane-Berman 2007)⁴.

Furthermore the majority of studies that address the cultural functions and significance of natural resources to local communities focus on areas or units of vegetation, such as sacred forests, rainmaking sites, land marks etc. (Posey 1999; Goebel et al. 2000). The cultural functions of harvested plants, particularly those used by urban communities, for the most part have been ignored (Cocks 2006). However in the Eastern Cape Province of South Africa several examples show how urban African (amaXhosa) communities continue to access natural resources to fulfil religious, ritual and spiritual requirements (Cocks and Dold 2000, 2004, 2006, accepted). These examples show that an increase in urbanization does not necessarily imply a loss of traditional cultural values related to the use of biodiversity.

Urban Africans access natural resources and their products primarily through informal markets such as street vendors. In South Africa, much attention has been given to the flow of cash and remittances from urban to rural areas; however, far less acknowledged is the reverse flow of goods and culture to urban areas (Wiersum and Shackleton 2006) and the significance of natural resources to urban cultural diversity (Cocks and Dold 2004). It has therefore been suggested that the concept of bio-cultural diversity needs to fully comprehend the relationship between humans and the environment in this regard. We present four short case studies, based on our own investigations among the amaXhosa people of the Eastern Cape Province of South Africa, that highlight the commoditisation of natural resources with specific reference to ritual, spiritual and customary practices.

⁴ *The average currency exchange rate for the South African Rand was R7.18 to the US dollar in 2007.*

1. Medicinal plants - amayeza yesiXhosa

A number of studies have documented the economic value of the trade in medicinal plants within urban contexts in South Africa (Cocks et al. 2004; Dold and Cocks 2002; Mander 1998; Williams 2004; Williams et al. 2000). It is estimated that the trade in indigenous plants is part of a multi-million Rand industry (Cunningham 1991). Very few of these studies however have reflected on the reasons why urban South Africans continue to purchase and make use of traditional medicinal plants (Cocks and Dold 2006).

Directly translated amayeza yesiXhosa means 'Xhosa medicine' and comprises plant, animal and mineral based medicines, for the treatment of both physical illness recognized by Western biomedicine and afflictions recognized by Xhosa people as caused by the supernatural (Kropf 1915; Soga 1931). For most Xhosa people good health, disease, success or misfortune are seldom considered to be chance occurrences, but are often the result of active intervention by individuals or the ancestors (izinyanya) (Gelfand 1957; Bührmann 1986; du Toit 1998; Hirst 1990).

Various ritual activities are undertaken to protect individuals and families and to strengthen their resistance against harm (Ngubane 1977). Communication with the ancestors is of foremost importance and using medicines, remedies and wearing protective necklaces are further health strategies (du Pisani 1988). Certain forms of ritual purification such as a ritual body wash (ukuhlamba ngeyeza), use of a purgative (ukugabha and ukucima), spraying (ukutshiza), fumigating (ukugxotha) or a steam treatment (ukufutha) as counteractive and protective measures often involve the use of plant material (du Toit 1998). Some illnesses (ukufa kwamaXhosa) are perceived to be effectively treated only with traditional Xhosa medicine (amayeza yesiXhosa), although symptoms may be relieved simultaneously with patent medicines (Cocks and Møller 2002).

An urban household survey in two cities, King William's Town and East London, in the Eastern Cape Province, revealed that almost 70% of urban dwellers used traditional medicine (amayeza) during a one-year period (Cocks and Dold 2006). The majority of the amayeza plants used by these households addressed non-physical afflictions including ritual, spiritual and magical uses. Of the 60 most frequently traded amayeza plant species, 50% were used for purging and 48% for ritual washing of the body, where both practices use infusions of plant material (Cocks and Dold 2006). These ritual applications are requirements for the treatment of, and protection against, sorcery, for communicating with the ancestors, for counteracting evil forces, for spiritual well-being and as charms. Over a one-year period, no less than 64 species were recorded as being purchased from urban traders. They were in an unprocessed state and used for self-medication without prescription from traditional healers. It is clear that urban dwellers are prepared to spend hard-earned cash to obtain these resources and that elements of traditional world views related to health care and well-being are still strongly adhered to in urban areas (Cocks and Dold 2006).

It is estimated that between 50 and 100 million indigenous medicine consumers in Southern Africa buy as much as 70 000 tonnes of plant material worth between US \$75 and 150 million each year (Diederichs 2006). More than 1 000 plant species are traded for medicinal purposes

in this country and it is acknowledged that intensive harvesting of wild material is a serious threat to biodiversity in the region. Research results attest to a trend of increasing harvesting pressures on traditional supply areas linked to a growing shortage in supply of popular medicinal plant species (Dold & Cocks 2002). The demand for some species exceeds supply, with traders reporting acute shortages and price increases of these species. As a result several plant species have been exploited to such an extent that they are seldom found in unprotected areas. The harvesting and trade of plant (and animal) material from wild populations for medicinal purposes has been, and remains, a controversial issue, particularly with regard to biodiversity conservation.

2. Traditional grass brooms - imitshayelo

In South Africa, much attention has been given to the flow of cash and remittances from urban to rural areas, however, far less acknowledged is the reverse flow of natural resources and culture to urban areas (Wiersum and Shackleton 2005). The lack of understanding of the complex role that natural resources fulfil in the lives of its users in South Africa is caused by the historic lack of attention to assessment of the relationship between nature and culture.

A case study on the economic and cultural value of hand made grass brooms, also in the Eastern Cape Province, reveals that 60% of the buyers of grass brooms in urban centres did so for traditional customary purposes (Cocks and Dold 2000). For example, the traditional wedding gift from a mother to her daughter. The traditional ceremonial presentation of the broom is called ukutyiswa amasi (literally to present a gift of sour milk) (Hunter 1936). Umtshayelo wesandle, meaning hand-broom, is symbolic of traditional Xhosa culture and signifies respect to the ancestors in the newlyweds' home. An urban "white wedding" is often followed by a traditional ceremony where the bride is presented with a number of traditional reed mats and several grass brooms along with pots, pans, basins and usually a bottle of brandy.

Just over 70% of broom buyers indicated that the presence of umtshayelo wesandle in the home served to protect the inhabitants from lightning (most often attributed to sorcery) (Soga 1931; Hunter 1936). A broom purchased for this purpose is placed above the door as a talisman but may also be used for sweeping when required.

A similar proportion of the respondents (72%) who purchased a broom reported that a grass broom is used to apply protective medicines indoors and around the homestead. The ritual in which an infusion of various plant materials is splashed or sprayed on the floor, walls and roof of the home is called ukutshiza (Dold and Cocks 2000). This ritual cleansing and purification ensures the good health and prosperity of the inhabitants (Soga 1931; Hunter 1936; Cocks and Møller 2002). The small broom used in this ritual is not used for cleaning.

The demand for grass brooms in urban areas indicates that many households living in urban centres still adhere to their cultural norms and practices and rely on wild harvested plants for these to persist. The trade also provides the opportunity for rural broom makers to generate an income. The trade value of grass brooms to producers is approximately \$240 per producer per year (Cocks and Dold 2000).

Cymbopogon validus is a widespread grass in the eastern parts of South Africa where it is common in mountainous and high rainfall areas. Due to its strong aromatic turpentine-like taste it is unpalatable and of little grazing value. While commercial farmers consider the species to be undesirable (Wells et al. 1986) it is valued in rural communal lands as a thatching grass and for making grass brooms. Seasonal harvesting for these purposes has been shown to promote annual growth (Shackleton 1990).

3. Wild Olive tree - *Umnquma*

Another recent survey revealed that material required for sacrificial rituals was the third most commonly cited wild resource use category amongst urban households (Cocks 2006). The ritual sacrifice (*isiko*) is performed on specific occasions to elicit ancestral blessings (Wilson et al. 1952, Poland et al. 2003) and to ask the ancestor for protection from malevolent forces such as sorcery (Dold and Cocks 1999). These sacrifices invariably involve the slaughter of a domestic animal, usually an ox or a goat. The host family invites clansmen, family, neighbours and friends to attend and large quantities of food and traditional beer are prepared. Preparations for these costly rituals can take up to five days (Cocks et al. 2006).

In the study area there are several important and commonly performed rituals that involve sacrifices. *Ukubuyisa* and *Ukukhapha* require the sacrifice of an ox in the cattle byre (*isiXhosa* – *ubuhlanthi*; South African English - *kraal*) to appease the paternal ancestors (*izinyanya*) soon after the death of the family patriarch, and are repeated on the first anniversary of his death. *Imbeleko* requires the sacrifice of a goat (male or female), also in the *kraal*, to introduce a newborn member of the clan to the ancestors. *Intambo* ritual is the solicitation of the ancestral spirits at the time of serious illness of a family member, during which a male goat is sacrificed in the *kraal* and the patient wears a protective necklace (*isiyaca*) made from the animal's tail hair. The customary initiation of Xhosa teenagers into manhood (*isiko lokwaluka*) by means of seclusion and circumcision requires the ritual sacrifice (*ukungcamisa*) of up to two or three goats, also in the *kraal*.

The women's equivalent to the *Ukubuyisa* ritual is called *Inkobe* and requires the sacrifice of a goat to appease the maternal ancestral spirits (*izinyanya*) soon after the death of the family matriarch and is repeated on the first anniversary of her death. The welcoming of a new bride to her husband's home and clan is called *ukutyiswa amasi*. A goat is sacrificed to introduce the new family member to the ancestral spirits. These rituals take place at the household's wood pile (*igoqo*) and are undertaken by clanswomen only (Cocks et al. 2006). Several other less commonly practised ritual sacrifices are known in the study area including those for the recruitment and graduation of diviners.

The ritual is a three to five-day event climaxing in the sacrifice presided over by the family patriarch. The sacrificial animal is chosen by the ancestors (*izinyanya*) and pointed out in a dream or by unusual behaviour of the animal itself. It is led into the *kraal* and prodded with a spear until it bellows, whereupon the gathering cheers in approval and the animal is finally stabbed in the heart and succumbs. The butchering of the carcass follows Xhosa protocol

(ukushwama) with choice cuts from the right shoulder (intsonyama) being set aside for the immediate family. Sheep are not sacrificed as they do not bellow when killed, this being the required indication that the ancestral spirits have accepted the sacrifice (Cook 1931). Should the animal be rejected by the ancestral spirits, the sacrifice and the entire ritual is abandoned and a second attempt is scheduled after consultation with the ancestral spirits.

On the day of the sacrifice young men and boys (not necessarily clansmen) go out, usually on foot, to collect umnquma branches for the sacrifice. There is no specific procedure or ceremony in the collection or placement of the material. The tree is common in the study area and access for the harvesting of material is unrestricted on communal land, municipal commonages and roadsides.

*The umnquma branches are used as a plate or platter (isithebe) to hold the meat of the sacrificed animal while it is being butchered. All clans in the study area typically use umnquma for this purpose, but many have additional plant species that are also used for this purpose. These deviations from the norm are clan specific and are identified through recurring dreams or with the assistance of a diviner. Examples of these include umthathi (*Ptaeroxylon obliquum*), and isundu (*Phoenix reclinata*). The umnquma branches remain in the kraal until the third and last day of the ritual when they are used as fuel to burn the bones of the sacrifice in a ritual called ukutshisa amathambo. The ash is finally swept into the ground of the kraal. According to our informants, umnquma is used because it symbolises the ancestral spirits.*

The wealth of the household was not significant in determining if the household made use of material for rituals ($\chi^2 = 0.56$, $df = 2$, $p = 0.764$) consequently demonstrating the cultural importance of these activities (Cocks 2006).

The trees are common in the study area and although there appear to be no community wide prohibitions against harvesting of leaf and woody material for ritual use, or for fodder, medicines and building materials, they are seldom felled, as it is considered taboo to kill the tree. Small leafy branches may be removed regularly and occasionally larger branches and stems are removed for construction but despite this abuse the often scarred and stunted trees are remarkably hardy and long-lived. Large trees are often incorporated into the village and homesteads where they may provide shade and support structures. In one imaginative case a tree serves as a mechanical workshop where motor vehicle engines are hoisted into the tree with block and tackle. In the study area this species is also used as a veterinary medicine (Dold and Cocks 2001) and small forked branches are used as whisks in the ritual preparation of herbal medicines by diviners (amagqirha). Occasionally small plants are planted in gardens for ornamental and shade purposes, but this is not common. The greatest threat to umnquma in the study sites is the clearing of land for commercial agricultural purposes such as pineapple production and pasturelands.

4. Pot-herbs - imifino

Cocks' (2006) urban household survey revealed that the consumption of wild leafy potherbs called imifino, remained relatively high (42%) amongst urban Xhosa households.

Imifino is collected in pairs or in groups and the preparation and eating is shared with extended family and friends. All imifino species, being common ruderals, are collected from either home gardens or disturbed ground such as roadsides etc. (Dold and Cocks 2000). Seven imifino species were recorded in the urban areas, the three dominant species being: Amaranthus hybridus, Sonchus asper and Chenopodium album.

Leaves and soft stalks are removed from the plant and soaked for around 30 minutes in cold water to remove dust and soil. The material is then chopped finely on a plate or chopping board and boiled for about five minutes in clean water with a pinch of salt. Most people prepare the dish according to a specific recipe (Husselman and Sizane 2006). The cooked material is added to maize rice, or maize meal, or eaten on its own.

In urban areas, women generally congregate in the sitting room once the dish has been prepared. The imifino dish is placed in the centre of the room and eaten using the fingers. It is considered inappropriate to eat imifino off crockery plates, or to use cutlery. One middle-class urban family reported serving a small portion of imifino with the regular European-style Sunday roast, showing a persistent urban link with traditional customs (Cocks et al. submitted).

The wealth of the urban household was only slightly significant in determining if the household consumed imifino or not ($\chi^2 = 8.34$, $df = 2$, $p = 0.015$), thus demonstrating that the consumption of imifino is not solely determined by the economic conditions of the household. The wealth of the household did however significantly influence the amount of material collected ($H = 9.65$, $df = 2$, $p = 0.008$). Poorer households collected the highest mean quantity per user household, 41 kg (\$6) per annum, and the middle and rich households collected similar quantities 25 kg (\$3) and 29 kg (\$4) respectively per annum (Cocks 2006).

The imifino plant species we have encountered are all cosmopolitan annual weeds and it is therefore difficult to trace the history of their use in South Africa. How and when these plants were brought to the country remains uncertain but by the 19th century most of them were already considered part of the traditional diets of African people. All imifino plants are collected opportunistically from home gardens, disturbed land or fallow agricultural fields in the wet summer months. While imifino plants are reported to be highly nutritious by some authors (Grubben & Denton, 2004, Van Wyk, 2005) others treat them as undesirable plants with respect to commercial agriculture (Wells et al. 1986). In recent times there has been a resurgence of interest in the nutritional value of imifino with government agencies and NGO's encouraging their use from an HIV-aids standpoint. While imifino is used extensively in South Africa, its potential value to rural food security, diets and income generation is not yet fully recognised and still no attempt has been made to grow the plants in any formal way (Shackleton 2003).

Discussion

In the past, most studies of the role of wild plant products in South Africa focused predominantly on understanding their importance for meeting basic household needs and obtaining additional income. Clearly the use of wild plant products is not restricted to such utilitarian purposes, but

also provides an important means for communities to articulate, assert and practise cultural values and to reaffirm social networks.

The case studies provide an example of the continuities in cultural practices in spite of the impact of global economic change as people who have migrated to urban areas and have become involved in modern economic sectors still perform certain cultural practices for maintaining a sense of well-being and expressing their identity (Cocks 2006). The high cultural value attached to the use of these resources is further demonstrated by the fact that the cultural uses of these resources were not restricted to poor households only. A significant percentage of the wild resources documented in the urban studies were purchased from vendors who commute regularly from their rural homes to urban centres. The trade of illustrate how NTFPs from rural areas help to sustain cultural values in urban areas but also allow rural dwellers to generate an income (Cocks 2006). This rural-urban link is facilitated by the diversification in rural livelihood strategies (Wiersum and Shackleton 2005).

These findings add support to the notion put forward by Cocks (2006) that the concept of culture must be understood as a dynamic process of trans-cultural exchange with constant re-articulations of tradition resulting in the persistence of certain cultural practices amongst groups of people. An increased understanding of this process is crucial so as to fully appreciate the scope of bio-cultural diversity conservation in developing countries.

The important cultural values attributed to individual plant species do not mean that their use is sustainable. Cultural value does not necessarily lead to harvesting restraint, and therefore cultural practices may be threatened by the destruction of the very species on which they depend. The cultural values attributed to many plant species could however be used as the foundation for policies to conserve biodiversity. Such policies have generally been applied in small homogenous communities in remote areas, but have seldom been extended to urban societies. In South Africa apartheid resulted in the breakdown of traditional rural structures in the former homelands and many people now live in urban or peri-urban communities. Our study has shown that even in these communities, people not only use wild plant resources for utilitarian purposes, but also rely on them in the performance of their cultural practices. We recommend that programs for the conservation of biodiversity should pay attention to people and plants on the rural-urban interface, and to the complex connections between the urban areas and their rural hinterlands.

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