Managing Cultural Ecosystem Services for Sustainability

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Introduction

It is widely recognized that ecosystems provide people with important non-material benefits “through spiritual enrichment, cognitive development, reflection, recreation and aesthetic experiences” (Millennium Ecosystem Assessment, 2005). These ecological contributions to non-material or ‘extra-material’ benefits, including both experiences and capabilities, have come to be known amongst ecologists and resource managers as ‘cultural ecosystem services’ (CES) (Chan et al., 2011). These ecosystem services (ES) are some of the most salient and compelling reasons for people to conserve or restore natural systems (Chan et al., 2012a). Accordingly, the management of CES is an essential consideration for sustainability, both because CES are crucial contributors to human well-being and because they may be key to sustainable human-ecological relationships.

Whereas CES were initially considered to be one class of ES alongside other categories (the Millennium Ecosystem Assessment also recognized provisioning, regulating, and supporting ES) (Daily, 1997, MA 2005), it has become increasingly clear that cultural practices and phenomena and CES are closely linked and are the lens through which many other ES derive meaning (Chan et al., 2011, Chan et al., 2012b, Church et al., 2011, Poe et al., 2013, de Groot et al., 2005). Indeed, in some social-ecological systems, provisioning services are so important locally precisely *because* they are the conduit for CES. In coastal British Columbia, Canada, for example, research has indicated that many extra-material benefits are associated with provisioning services, especially fishing of all kinds (e.g., subsistence or food fish, commercial, or recreational) (Klain et al., 2014, Klain and Chan, 2012). City dwellers appear to be comparatively more focused on non-material CES derived from non-extractive recreational experiences and associated imagining (Martín-López et al., 2012). Regardless, CES continue to be key to human relationships with and understandings of nature, shaping the very worldviews containing the meaning of these relationships (Church et al., 2011, Chan et al., 2012b, Tengberg et al., 2012, Gould et al., 2014a, Matsuoka and Kaplan, 2008). More recently, the centrality of the meaning-making processes associated with knowing, perceiving, interacting with, and living within landscapes (Russell et al., 2013) has been coined the ‘culturality of ecosystem services’ (Pröpper and Haupts, 2014). In short: as a class of ES, CES are foundational: managing CES means managing other ES, and vice versa.

Although the notion of sustainability is present explicitly or implicitly in prominent writing on ES (Millennium Ecosystem Assessment, 2005, TEEB 2009), the culturality of ES shines a light on an unresolved tension that has yet to be addressed. That is, we might be able to imagine the sustainable management of a provisioning or regulating ES, but perhaps not what it means to sustainably manage CES. Human needs for protein, fiber, and physical security might seem stable requisites of any system. Likely less stable are cultural and social systems and linked CES, as changes to these systems may predictably or unpredictably change CES in complex ways. This is particularly so when trying to ‘manage’ for different futures, developments or generations. What landscape features and configurations will future generations find attractive? What sites and landscapes will they find spiritually fulfilling, saturated with meaning and histories of place, or appropriate setting for social well-being? Clearly, for CES—and so all ES—sustainable management implies more than the maintenance of particular ecosystem stocks or flows.

What sustainability might imply for CES—and so all ES—is the subject of this chapter. We first briefly review the history of research and thinking on CES. We then consider more fully the potential operationalization of connections between biophysical attributes and culture or non-material values. Turning our attention to sustainability, we discuss the implications of competing notions of sustainability for management. On that basis, we integrate considerations of CES and sustainability to advance several propositions regarding appropriate management for CES and so all ES.

Cultural Ecosystem Services, A Brief History: Everywhere and Nowhere

The number of disciplines and sub-fields that have documented the ways in which people derive non-material benefit from ecosystems is truly dizzying: psychology, education, anthropology, sociology, planning, environmental health, medicine, diverse humanities, etc. (Russell et al., 2013). And yet, despite this tremendous wealth of literature, very few have sought to characterize these ecosystem contributions as CES, that is, to characterize and assess the magnitude of all manner of positive ecosystem contributions to individual social and cultural health (Russell et al., 2013, with a few exceptions, Daniel et al., 2012). And within the ES literature itself (a literature newer than the fields listed above), there is a notable dearth of attention to most CES (Hernández-Morcillo et al., 2013). One possibility is that this is due to their sometimes incommensurate value, intangibility and ontological complexity (Chan et al., 2012b). Ultimately, this amounts to no small irony: CES pervade all ES and similar literatures, but their characterization as such is nascent or in its infancy at best (Daniel et al., 2012, Chan et al., 2012a).

This ‘everywhere and nowhere’ paradox of CES stems from the central advance in the ES literature, *which is also its greatest limitation*. The ES literature focuses exclusively on quantification of the ecological contribution, with special attention to changes in ES via change in ecosystems (Daily et al., 2009, Kareiva et al., 2011), while admitting but not focusing on a wider array of social and social-ecological interactions. This focus of conventional ES has been enormously productive as concerns economic approaches to cost-benefit analysis and valuation of environmental goods—a productivity also reflected in the ES concept’s burgeoning popularity (Costanza and Kubiszewski, 2012). It also privileges a single, incomplete way of thinking about social-ecological interactions (Raymond et al., 2013).

Because some CES are much more conducive to rapid assessment using quantitative approaches, treatment of CES tends to focus on visual aesthetics, and the relative desirability of different landscapes (again, aesthetically). Thus, physical and structural changes have been linked to assessments of desirability (Daniel, 2001, Chamberlain and Meitner, 2012), and/or their worth in monetary terms (Benson et al., 1998, Grêt-Regamey et al., 2008). Similarly, the study of recreation and tourism includes various survey and experimental approaches to isolate the contribution of rock paintings, bird species, and other wilderness attributes on demand or willingness to pay (Boxall et al., 2003, Naidoo and Adamowicz, 2005), such that general models of ecosystems’ contribution to recreation and tourism are available for ES modeling (Adamowicz et al., 2011). Most of these treat CES as ‘culture’ in the high- or popular-art and aesthetics point of view, and not culture in the broader sense of the diverse practices, meanings, identities, and collective expressions and organizations that make for unique human communities (Satterfield et al., 2013).

For many researchers of culture, the suggestion implicit in ‘cultural ecosystem services’ that nature produces culture is both laughable and offensive (Fish, 2011). Disentangling the contribution of particular ecosystem structures and functions to such ‘big’ ideas as “belonging, cultural heritage, and other symbolic meanings” strikes some as impossible (Kirchhoff, 2012). There are also concerns about the economic metaphor at the core of ES (Raymond et al., 2013, Luck et al., 2012), and about the exclusive utilitarian and anthropocentric focus, which excludes consideration of other ethical perspectives (including

principles, virtues, and other relational values)(Jax et al., 2013) and of the needs of non-human nature (Rees, 1998, Luck et al., 2012). Moreover, there is the problem of quantification in a single metric, which presupposes that diverse values are commensurate (permit trading-off), when in fact many people resist such trade-offs in many settings (Chan et al., 2012b, Satz et al., 2013). The valuation in monetary terms triggers concerns about commodification, in part because dominant socio-political trends and the particular institutional settings for ES (ES markets and payments for ES) push simultaneously toward valuation and commodification (Gómez-Baggethun and Ruiz-Pérez, 2011).

The Quandary of ‘Cultural’ Nested in Ecosystem Services

If non-material or extra-material values pervade most if not all ES, and if many such ‘cultural’ values are also complex and resist quantification, does it follow that the whole project of ES is a boondoggle? Must all ES research dwell on the value complexity of non-material or extra-material considerations? Must studies of agricultural ES also quantify non-material values affected by the altered production or availability of commercial produce? Must studies of the ecological provision of hydropower, for instance, also consider the cultural significance of more abundant energy?

Our position here is that while most ecological or ES changes will affect some non-material experiences or capabilities, some contexts and problems seem to require explicit consideration of value complexity and others not. First, many ES studies simply quantify ecosystem supply (Tallis et al., 2012), for which biophysical metrics are appropriate. Other studies can interpret the value significance of such biophysical quantities. Second, even when the scope includes benefits and values, and there are important non-material values at play, one-dimensional monetary values may suffice. Tourism and recreation are a case in point: market valuation and travel-cost methods are widely accepted and relatively uncontroversial methods for valuing these benefits associated with ecosystems and particular ecological attributes. On the other hand, few imagine quantifying spiritual benefits associated with ecosystems in monetary terms (Daniel et al., 2012), although context-specific constructed scales or quantitative participatory scoring offers considerable promise (Satterfield et al., 2013).

The applicability of one-dimensional valuation techniques depends on the nature of the value at stake. Chan and colleagues identify eight dimensions of variation in values (preferences vs. principles vs. virtues; market-mediated vs. not; self- vs. other-oriented; individual vs. holistic/group; experiential vs. metaphysical; supporting vs. final / instrumental vs. inherent; transformative vs. not; and anthropocentric vs. biocentric) (Chan et al., 2011, Chan et al., 2012b). Each dimension has implications for the appropriate valuation processes (Chan et al., 2012b), but a key consideration for the appropriateness of one-dimensional valuation is whether the key benefits in question are mediated mainly by markets. In short, if we have the practice of market exchanges, there are opportunities for respondents’ willingness-to-pay or accept estimations to be corrected by experience (Sagoff, 1998). Tourism, although largely non-material, is mostly market-mediated. Some forms of recreation are also mostly market-mediated in the sense that they require considerable purchases or expenses in order to access sites.

When the benefits at stake are mostly market-mediated, a variety of approaches to valuation may be appropriate, including market valuation, travel-cost method, hedonic valuation, and avoided costs (EPA Science Advisory Board 2009). To the extent that the experiences and capabilities in question are realized partly outside of markets (e.g., entry to a regional park is free because of a community-wide commitment to public access), the results of such monetary valuations are likely under-representations of the worth of such benefits to people. Economists recognize that such ‘passive-use values’ are difficult to value accurately, for several reasons (Adamowicz et al., 2011). Consider here the example of aesthetics. To a degree, we purchase access to visual aesthetics through home purchases or room rentals, and these can be valued using hedonic pricing (National Research Council (U.S.) 2005). But for those who have particular attachments to a place, the assumption that all else is equal among alternative

homes/rooms is violated (an assumption implicit in hedonic pricing), and the view is a function not of market transactions but rather of collective action, community-wide commitments, and larger forces (including demographic change). For example, in cultural landscapes the aesthetics are inextricably intertwined with multiple values (Klain et al., 2014, Klain and Chan, 2012), including social and educational values (Plieninger et al., 2013b), sense of place, spirituality (Gee, 2010), and triggers for heritage and identity (Tengberg et al., 2012). Furthermore, one is generally not able to purchase substantial changes to one's home landscape (Plieninger et al., 2013a). Thus, while monetary valuation of landscape differences may appropriately represent the aesthetic values to tourists (Grêt-Regamey et al., 2007), one-dimensional valuation may substantially under-represent the worth of landscape differences to locals, and it may be inappropriate (Klain et al., 2014, Klain and Chan, 2012, Chan et al., 2012b).

When the benefits are not primarily mediated through markets, other approaches exist to characterize and even quantify the value dimensions of potential changes. Notable among these are two approaches, each of which includes qualitative dimensions. First, narrative-based approaches are intended to elicit values through field-tested, and even provocative questions (Satterfield, 2001, Klain et al., 2014, Gould et al., 2014a, Gould et al., 2014b). For example, regarding identity and educational values, the interviewer might ask, "Are there places that are important to your sense of identity ..." or "Have you ever had the experience of a place(s)—or time in the forest or in or on the water—teaching you things?" (Satterfield et al., 2013, Gould et al., 2014b). Maps are helpful in such exercises (Gould et al., 2014b), and the non-monetary values of sites may be spatialized and/or quantified (Klain and Chan, 2012, Satterfield et al., 2013), although this step may be resisted by a substantial number of interviewees (Klain and Chan, 2012). Narrative approaches can also be paired with photo elicitation, which enlists interviewees as active participants in the process by having them take photos of significant features, such that the photos may then be used as prompts in subsequent interviews (Sherren et al., 2010).

Second, although stakeholders may be unwilling to assign quantitative values to benefits on a pre-existing scale, they may be willing to attach relative importance rankings to characterizations of a [cultural] state or quality through 'constructed scales' (Satterfield et al., 2013). Such an approach follows the logic of structured decision-making, an approach that has been well honed over decades to facilitate difficult decisions with multi-dimensional value implications (Gregory et al., 2012). In this approach stakeholders share in the construction of carefully designed quantitative-qualitative scales that can represent anything from the multi-dimensional 'spiritual quality' of a river or the meaning of community stewardship. This might be done, for example, using a five-point scale where each level is coupled with a brief place-specific verbal articulation of the qualities in question: the sound, sight, smell and feel of a river that constitute its spiritual qualities, in one example (Satterfield et al., 2013, Failing et al., 2013). Such measures cannot be transferred to other places, but they can be powerful in the adaptive management of the place in question, and they can be 'aggregated' up into more comprehensive measures such as 'quality of place' where the dimensions of quality might be spiritual quality in one setting, and 'access to beaches' in another, but overall capture locally meaningful attributes of 'place'.

Sustainability in a Cultural Context

To paraphrase Kitayama (2002), culture is to humans as water is to fish: Cultural phenomena are the air we breathe, the norms and practices that constitute or are the currency of identity, the extra-material life of most things that giving meaning to the physical world. We are immersed in culture, and it permeates every perception. The quote is also apt in that cultural worlds, like water, are constantly changing; we, like fish, are constantly adapting. If cultural change is the process of substituting new means of satisfying existing needs and preferences (Max-Neef et al., 1992), such change will occur naturally as a process of adaptation, including adaptation to ecosystem change. This adaptation may buffer, or appear to buffer, the negative consequences of ecological and ES change. What then would sustainability imply for CES? Maintaining human well-being despite cultural and ecological change (including via cultural

change in response to ecological change)? Maintaining CES as they were? Or, as we will argue, maintaining CES for the sake of cultural continuity and sustainable social-ecological relationships, as decided by affected parties and by those best poised to represent the many without a voice?

These questions intentionally suggest a parallel between CES and the notions of weak and strong sustainability (e.g., Solow, 1974, Hartwick, 1977). Our goal here is not an elaborate treatment of these two perspectives, but to enrich our discussion of CES in reference to one important discourse on sustainability. These two competing visions of sustainability have been articulated in reference to the maintenance of various forms of capital, including human capital (knowledge and skills), financial capital (money), built or manufactured capital (infrastructure), and natural capital (biodiversity and ecosystem structures and functions needed to produce ES). The distinction between strong and weak lies in what must be maintained: whereas strong sustainability implies a non-diminishing stock of natural capital, weak sustainability allows substitution of human-made capital for natural capital (Cabeza Gutiérrez, 1996). Suspending for the moment worthy points about the limitations of either perspective (Bromley, 1998, Robinson, 2004), we first consider how CES might fit into each.

At first glance, the relationship between ES in general and sustainability appears simple. Most ES, as flows of benefits, are effectively the interest or revenue streams from stocks of natural capital. By this logic, there exists a strong argument that sustainability requires describing and protecting the stocks of natural capital necessary for the sustained provision of ES (Potschin and Haines-Young, 2011). At this level, the difference between strong and weak sustainability is crucial. Strong sustainability requires that stocks of natural capital be protected without consideration for substitution of natural with human-made capital. In contrast, weak sustainability allows such substitution. Weak sustainability, however, does not explicitly address the very difficult project of determining when, and to what extent, the substitution of depreciating human-made capital for (often) self-sustaining natural capital can yield sustained stocks of total capital (however that might be measured).

For CES, we are spared that stark choice by another complexity: CES being unlike other ES may be considered *capital-producing*. That is, some CES yield capabilities that allow people to access other benefits, including through interactions with nature. In this way, CES produce a portion of human capital (*capabilities*) that is especially important for realizing benefits from nature (both material and non-material). We might call this 'human-natural capital'. Other CES, which produce *experiences* with nature, are essential for the production of the aforementioned human-natural capital. These experience-producing CES yield the analogue of *seed capital*: they produce the capital that enables the human-natural capital (the capabilities). (We acknowledge the irony that CES are not normally associated with capital in the market sense of the word.)

Take, for example, the case of coastal food fishing amongst First Nations off the coast of British Columbia, Canada. Chan et al. (2011) describe the surprising key value placed on black bass (*Sebastes melanops*) by First Nations men in Kyuquot Sound. The men in question quite explicitly taught one of us (KC) that only certain experiences were sufficient to captivate young boys as fishermen. The fish had to be predictably abundant enough to yield frequent bites, animated enough to provide a challenging but feasible fight, and tasty enough to produce a tangible reward. In this way, the 'gateway' experience of angling for black bass was used to sustain boys' attention for long enough that they developed the crucial capabilities, and the needed love to fish for a lifetime thereby enabling the continuity of a cultural world dependent both on wild fish and the practice of fishing. While on the water, these boys likely also developed key social bonds and social capital, derived activity benefits, spiritual understanding, place attachment, the boat-handling skills and knowledge of the ocean needed for various forms of marine employment, etc.—that is, numerous other non-material benefits via CES.

Unlike natural capital, which—when not subject to large-scale environmental change—is often self-sustaining, human-natural capital depreciates. CES may degrade due to distractions, changes in normative practices, forgetting, the turnover between generations, or forced disruptions and displacement of human communities world-wide. Human-natural capital, that is, must be continually re-created. In many parts of the world, the process of renewal itself is the reconsideration and self-determination of traditional practice. Thus, traditional ecological knowledge (TEK) is renewed and transmitted through practice. Interruptions to that process of transmission can be devastating for the natural capital that is actually partly a result of human-natural coproduction.

The onslaught of colonization for First Nations peoples in Canada illustrates this loss of CES and its associated impacts on other ES and biodiversity (Turner and Turner, 2008). Residential schools programs, forced relocations, suppression of native languages, successive disease transmission and outbreaks, and the reduction of 'native space' to tiny reserves (Harris, 2011) devastated all manner of human-natural capital, be that expressed as estuarine gardens (Deur, 2002) or elaborate social organizations enabled by the sheer wealth of salmon and so enormous cultural benefits derived from healthy ecosystems (Masco, 1995). Whereas residential schools and reserves restricted movement greatly, historically, many would have migrated seasonally from one harvesting ground to another (e.g., harvesting edible seaweed on rocky beaches and clams on sandy ones, camas bulbs in the grasslands, salmon in the estuaries), transmitting TEK across time/generations and space, tending the seaweed patches, 'clam gardens', camas fields and salmon streams to enhance their future productivity (Turner and Turner, 2008, Lepofsky and Caldwell, 2013). Colonization, residential schools, et cetera, are thus widely understood to have degraded or changed subsistence harvest in a way that eroded CES (including both experiences and capabilities), and fundamentally altered the trajectory for coastal populations and associated landscapes (Turner and Turner, 2008, Turner et al., 2008, Chan et al., 2011). Lest one imagine that this corrosive scenario applies only to Indigenous or land-based peoples, one should consider hypotheses of nature-deficit disorders, which holds that loss of time and free play outdoors (Veitch et al., 2007) is impeding creativity, learning, and spirituality, and enhancing the accumulation of stress, and incurring numerous health and behavioural problems (Louv, 2008).

The discussion of capital (however understandably onerous and loaded the term is for many) is helpful to recognize the potential role of CES in capital formation and so sustainability. But what in practice is the sustainability of CES, given the above point about continual unfolding of cultural practices and norms? Is it letting individuals and collectives dictate the changing nature of CES, assuming that this will maintain CES at a given level, but with desired substitutions? Should we be agnostic if CES change from non-consumptive or low-technology activities that involve sustained and intimate interactions with organisms and ecosystems (e.g., kayaking, subsistence hunting, or commercial fishing), to technology-intensive activities that treat nature more as a site for thrills (e.g., mud-running, an activity involving driving all-terrain vehicles up creeks at high speeds)? Is it paternalistic to favour some preferences over others?

Several considerations about human behaviour bear mentioning in answering the above question, essentially about CES 'sovereignty' (that preferences are unquestionable) (Norton et al., 1998). First, people, and so their surrounding cultural worlds, adapt to changing circumstances (Norton et al., 1998). This adaptation has normative implications, as in the theory of shifting baselines (Pauly, 1995), which holds that each generation newly imagines the pristine or optimal state as something like what they encountered in nature as youths or young adults. (Communities more deferent to ancestors and oral history might be less this way.)

Second, although such adaptation may obscure the recognition that something is degraded progressively through time, it may nonetheless be the case that much is lost, but not immediately evident (as illustrated with First Nations and the nature-deficit hypothesis above). Agency, or the ability to determine one's fate or collectively and democratically deliberate futures desirable for a community, is

fundamentally important to human well being (Holland et al., 1998, Sparks et al., 2001, Thoits, 2006). However, the apparently free 'choices' that people make can also undermine their long-term well-being (Layard, 2006), for a wide variety of reasons including imperfect 'rationality' (Kahneman, 2013), individual social traps (by which a behavioral choice with short-term gains acquires significant long-term harms, e.g., overeating, smoking) (Platt, 1973), cultural cognition (the tendency for people to perceive risks in ways that cohere with their cultural values and associated social groups) (Kahan et al., 2012), and the compelling power of marketers who exploit these various foibles (Cialdini, 2007, McLuhan, 1951). Unfettered 'free choice' will not necessarily yield positive outcomes for human well-being in the long-term, either for individuals or across generations.

Given the complexities of thinking about capital, both natural and cultural, and the contested nature of the strong vs. weak sustainability conversation, we suggest a definition of sustainability that says nothing explicitly about capital. We favour a definition in line with the Brundtland Commission's (Brundtland, 1987) definition, but generalized so that it can be applied at any spatial scale, and also within a generation (not just between): *sustainability is living within our means, such that our actions and lifestyles do not diminish the capacity of others to live well*. This definition is perhaps aspirational, given the apparent unsustainability of resource use (Wackernagel and Rees, 1996) and our apparent collective transgression of planetary boundaries (Rockström et al., 2009). It is also intentionally broad, to enable the 'constructive ambiguity' that is so powerful at capturing imaginations (Robinson, 2004).

And yet: if sustainability does not imply simply allowing culture and CES to adapt to new conditions and active efforts already in play (e.g., advertising) (Norton et al., 1998), how then do we manage CES for sustainability? Thus far, the management of CES has been a taboo topic for several reasons, one of which is surely an appropriate queasiness about social engineering, paternalism and like postures regarding knowing what is best for 'people' and 'nature' (Norton et al., 1998). To this, two responses are critical. First, preferences, behaviour, consumption, and so (directly and indirectly) CES are being managed everyday by powerful forces of marketers and in some cases dictatorial governments (McLuhan, 1951, Norton et al., 1998). Second, the principle concern appears to be about manipulation by *outside* agents (Norton et al., 1998). Arguably concerns of paternalism would be largely mitigated through a deliberative democratic process that questions the legitimacy and appropriateness of different sets of preferences and cultural trajectories. Such a solution is consistent with Sagoff's (1998, 2004) view on citizen preferences and Epstein's (2009) work on reconciling individual choice and the common good.

Managing Cultural Ecosystem Services

The lion's share of discussion about sustainability appears to be about the management of resources or environmental sustainability only and *not* about the relationship between ES and CES. Considering CES forces one to grapple with sustainability as a process of managing three different aspects: ecosystems, human preferences and values, and resulting social-ecological interactions. From an economic perspective, these three aspects might be seen as *supply*, *demand*, and *access*. Below, we treat each of these three aspects in turn.

Although people adapt to changing circumstances and baselines, ecosystem quality (*supply*) does seem to matter for the maintenance of CES. The relationship is almost certainly nonlinear, of course, albeit variable across contexts. For example, coral reefs across the globe have been degraded over the past several centuries and face new threats (Pandolfi et al., 2003), and yet even many of the hardest hit regions continue to enjoy the benefits of coastal tourism including snorkeling and diving. At some point, however, the resilience of these CES will likely be surpassed, perhaps even before the reefs are replaced with slime (Pandolfi et al., 2005).

In some nations, there has been a widespread shift in *demand* away from local- to national-level nature-based recreation experiences that can be largely explained (statistically) by a rise in video games, home movies, theatre attendance and internet use (Pergams and Zaradic, 2006). These marked declines appear to be limited largely to the US and Japan, however, as many other nations have enjoyed an increase in nature-based tourism (Balmford et al., 2009) (and the decline in US national park visitation is correlated statistically with a rise in income and in foreign travel, including to protected areas elsewhere (Pergams and Zaradic, 2006)). Thus it is unclear whether there are global declines in demand for CES; it is however quite clear that demand is highly variable and likely subject to change, including intentional.

The concept of environmental identity may be useful here, as it appears to manifest in the quantity of interactions with nature, perceived importance of those interactions, positive experiences in nature, and approval of pro-environmental behavior (Clayton, 2003). Environmental identity is a function of social context, through the values and activities of one's friends and family (Clayton and Opatow, 2003). Accordingly, as alluded earlier in the chapter, demand for CES cannot be disentangled from the experiences and capabilities that are products of CES (access begets demand and vice versa). Thus, one of the strongest predictors of environmental identity appears to be whether an individual had positive experiences of nature as a child or youth in the company of adult role models (Chawla, 2007). This suggests both that parents have tremendous capacity to encourage (or stunt) an appreciation of nature, and that the quality of nature that enables high CES (positive experiences) is also an important factor in the production of future demand and therefore access. A critical component of environmental identity (as fostered by childhood experiences with role models) is the strong impact on active care for the environment (Chawla, 2007). Thus, experiential CES beget CES, and also the stewardship that sustains nature, which is important for others' enjoyment. By this logic, CES may be the keys to sustainable social-ecological systems.

Because of the centrality of these *interactions* with nature, environmental management for sustainability can no longer be thought of as a process of protecting nature. Rather, management for sustainability must include consideration of how management change will affect demand for, and access to nature, especially the kind with strong impact on attitudes toward nature.

A general principle of sustainability might require the mitigation of harm from both social and environmental change. But since 'harm' is a function of preference and values, and these are subject to change via the same social and environmental change, we must attend carefully to identity- and preference-shaping influences. But who should get to decide about these influences? How about those affected, following a principle of truly informed consent, and those who can best stand in their stead? Perhaps sustainability should be understood as a requirement for appropriate procedures rather than for a particular level of resources or material well-being (Robinson and Cole, 2014).

The dynamic nature of values, and CES, demands a thorough consideration of appropriate methods for making all manner of decisions, including about energy futures, urban plans, infrastructure projects, etc. Such thoroughness is beyond the scope of the current chapter, but four points bear mentioning. First, value-focused structured decision-making is specifically designed to address the 'constructed' nature of preferences and the complexity of values (Gregory et al., 2012). Second, a critical component of structured decision-making is making explicit the likely consequences of decisions. Above we have argued that changing preferences, values, and relationships may be crucial outcomes, but such outcomes are rarely identified explicitly (the focus is generally instead on material values, and to a lesser extent on non-material impacts on well-being). In fact, in western societies public policy is dominated by an economic body of thinking that conventionally assumes away any impacts on preferences or values (assuming that preferences are given and stable) (Norton et al., 1998). Third, politics and political ecology must always be at the forefront of our thinking about decision-making. Too often policies and infrastructure changes have the effect of benefiting a well-off minority at the expense of the majority and

especially the poor (Freudenburg et al., 2008). Fourth and finally, because many social-ecological losses are of limited reversibility, special consideration should be given to the long-term well-being consequences of losing slow-changing ecosystem features and associated CES. Given the necessarily limited understanding of the well-being implications of recent replacements of technology for interactions with nature, we might be hesitant to sanction yet further erosions of CES. The biophilia hypothesis (Kellert and Wilson, 1993) would suggest that substantial changes in nature and in human-nature relationships are likely to diminish human well-being by a variety of processes, because we coevolved with nature and have thus become dependent upon it in often-unappreciated ways.

Collectively, we must decide what values we allow to be influenced by which forces. The current laissez-faire approach permits advertisers to manipulate values at will for the sake of economic growth. Yet economic growth, beyond a relatively low threshold of approximately US\$20,000/year in gross national income, appears to yield no gain in well-being (Max-Neef, 1995, Layard, 2006). Thus, during the time that US has seen substantial declines in nature-based recreation, it has seen either a loss (Max-Neef, 1995) or no net gain (Layard, 2006) in well-being despite substantial increases in income. And via CES, nature contributes greatly to human well-being, albeit in many intangible and invisible ways (Russell et al., 2013). A strong argument can therefore be made that an investment in nature and benign interactions with nature (as in CES) would be in our collective interest.

Conclusion

The study of CES, as nature's benefits to people through non-material processes, is a small subset of a much larger set of interdisciplinary literatures on social-ecological interactions. In the sustainability literature, CES have received short shrift. And yet, such CES can be seen as a new kind of human-natural capital, and as capital-producing: not only do positive experiences and attachment with nature yield both well-being and key capacities, they also yield the stewardship attitudes and identities that may be fundamental to local and global sustainability.

Key Learning Points/Take Home Messages

- Cultural ecosystem services (CES), as nature's contributions to people via non-material processes, are not a separate independent category of ecosystem service, but rather the layers of meaning through which most ecosystem services are understood and valued.
- The importance of any given benefit to a person or group can be categorized into at least eight dimensions of value, each of which has implications for appropriate approaches and methods of valuation.
- CES provide the capabilities and experiences that enable people to benefit from a wide range of ecosystem services and to develop deep personal relationships with nature; they can therefore be thought of as human-natural capital, as capital-producing, and sometimes as stewardship-fostering.
- Because CES can be degraded by a variety of psychological and social processes (and yet are key to human well-being), sustainability implies the maintenance of social-ecological relationships conducive to CES.
- All ES, in particular CES, are functions of preferences and values, which are manipulated and influenced by advertising and other aspects of social context; sustainability therefore seems to require deliberative decision-making regarding the values and futures we wish to foster.

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