



Hard choices: Making trade-offs between biodiversity conservation and human well-being

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ABSTRACT

Win–win solutions that both conserve biodiversity and promote human well-being are difficult to realize. Trade-offs and the hard choices they entail are the norm. Since 2008, the Advancing Conservation in a Social Context (ACSC) research initiative has been investigating the complex trade-offs that exist between human well-being and biodiversity conservation goals, and between conservation and other economic, political and social agendas across multiple scales. Resolving trade-offs is difficult because social problems – of which conservation is one – can be perceived and understood in a variety of disparate ways, influenced (in part at least) by how people are raised and educated, their life experiences, and the options they have faced. Pre-existing assumptions about the “right” approach to conservation often obscure important differences in both power and understanding, and can limit the success of policy and programmatic interventions. The new conservation debate challenges conservationists to be explicit about losses, costs, and hard choices so they can be openly discussed and honestly negotiated. Not to do so can lead to unrealized expectations, and ultimately to unresolved conflict. This paper explores the background and limitations of win–win approaches to conservation and human well-being, discusses the prospect of approaching conservation challenges in terms of trade-offs and hard choices, and presents a set of guiding principles that can serve to orient strategic analysis and communication regarding trade-offs.

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1. Introduction

In a world of persistent poverty, accelerating resource extraction, and climate change, the challenges to conserving the planet's biodiversity seem increasingly insurmountable. Species and habitats continue to disappear and the ecosystem services vital to the health of animal, plant, and human communities alike are increasingly disturbed. While the loss of global biodiversity is well documented, there is considerable debate within the conservation field about how to respond most effectively (Wells and McShane, 2004; Agrawal and Redford, 2006; Brockington et al., 2006; Wilkie et al. 2006; Roe 2008).

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Given the geographic juxtaposition of human poverty and biological wealth (Sanderson et al., 2002; Sanderson, 2005; Redford and Fearn, 2007), one obvious approach is to design management responses that enhance the well-being of local people while simultaneously halting the destruction of ecosystems. Over the past several decades a variety of such “win–win” approaches have sought to conserve biodiversity while also furthering local social and economic development. The logic and rhetoric of win–win underlies a number of popular conservation approaches and programs, including debt-for-nature swaps, extractive reserves, community-based conservation, and integrated conservation and development projects.

Unfortunately, the record of such approaches is decidedly mixed. A gathering body of evidence seems to indicate that, across a variety of places and contexts, trade-offs can and do occur between different conservation objectives (such as biodiversity and

ecosystem services), and between human livelihoods and conservation (Faith and Walker, 2002; Adams et al., 2004; Brown, 2004; McShane and Wells, 2004; Garnett et al. 2007; Cheung and Sumaila, 2008; Sunderland et al., 2008; Chhatre and Agrawal, 2009; Dahlberg and Burlando, 2009; Sandker et al., 2009; but see also Nelson et al., 2009). Yet it remains rare that the full range of possible trade-offs are acknowledged in communications with funders, policy-makers, and the public, or explicitly discussed as conservation interventions are sought. On the contrary, the pressure to act, and the undesirability – at least from a politicians' or donors' point of view – of acknowledging possible downsides and losses can lead conservationists to feel the need to offer optimistic win–win scenarios about the feasibility of addressing multiple agendas. Failing to be open and explicit about trade-offs can thus occur even when conservation practitioners are themselves quite aware of some of the potential downsides of a given scenario or proposal.

As initiatives propelled by win–win optimism are scaled-up and replicated, and as the realities of trade-offs are experienced either by actors expecting to “win” or by those not considered in the equation at all, the stage seems set for a vicious cycle of optimism and disenchantment (Wells and McShane, 2004). To continue to feed this cycle benefits neither nature nor people. A new challenge, and a new set of debates, therefore, is emerging for conservationists: to find ways to identify and explicitly acknowledge the trade-offs and hard choices that are involved in advancing conservation in specific places and through specific approaches.

So how should analysis and communication regarding trade-offs within conservation, and between conservation and other social goals proceed? In particular, how can such analysis and communication operate in a way that provides an opening for grappling with the full range of values and dynamics that shape what may be lost and what gained when conservation decisions are made and implemented? After discussing in more detail the background and problems with the win–win approach to conservation, we discuss the value of focusing on trade-offs and hard choices in the evaluation of plans and proposals for advancing conservation. We then pose a specific set of guiding principles, developed and refined over the course of 2 years of research, workshops, and discussions, that can serve to orient discussions and analysis regarding trade-offs.

2. The evasive promises of win–win and the need for trade-off thinking

Win–win language has become common among international organizations (multi-lateral and bilateral aid agencies, development and conservation organizations) to describe the simultaneous achievement of positive conservation and development outcomes. The use of this language has been most pronounced in policy discourse regarding the link between the environment and poverty reduction. Relieving poverty through a renewed focus on this link is acknowledged today as the primary goal of many development efforts including the Millennium Development Goals, the UNDP-EC Poverty and Environment Initiative, and the Convention on Biological Diversity (OECD, 1996; Ambler, 1999; GEF, 2005). Most development assistance agencies are hesitant to support conservation initiatives unless links to reducing poverty can be demonstrated. Meanwhile, conservation organizations have increasingly added efforts to address poverty reduction in their conservation initiatives.

Win–win approaches to conservation have the appearance of being ethical, efficient, and highly marketable. They appear to

be ethical in the sense that they acknowledge the dual moral imperatives of protecting the earth's natural systems and ameliorating human poverty. They appear to be efficient in the sense that they seek to create and/or capitalize on synergies between local needs and desires and regional and global conservation priorities. And they appear to be marketable in the sense that the promise of no losses to biodiversity and human well-being in a single approach makes for popular political discourse and good copy for grant writing. Unfortunately, while the marketability of the win–win concept remains robust, it remains quite doubtful that it is an adequate descriptor of the outcomes that actually occur.

2.1. Problems in achieving win–win outcomes

After more than 20 years of international conservation experience, initiatives that produce win–win outcomes appear to be the exception as opposed to the rule (Robinson, 1993; Songorwa, 1999; Christensen, 2004; McShane and Wells, 2004; GEF, 2005; Redford and Fearn, 2007; Sunderland et al., 2008). Only rarely have initiatives realized outcomes that demonstrate how natural resources can be managed in ways that achieve benefits for local people while sustaining local and global biodiversity conservation values (Barrett and Arcese, 1995; Agrawal, 1997; Redford and Richter, 1999; Wells et al., 1999; Ferraro, 2001; Wells and McShane, 2004; Miller et al., 2011).

On the conservation side of the equation, criticisms by ecologists of integrated conservation and development initiatives center on the idea that humans usually, although not always, improve their condition by simplifying nature to the detriment of its biological diversity (Robinson, 1993; Freese, 1998). Integrated projects that rely on extraction and use of the natural resource base have been critiqued as fundamentally ecologically unsound (Songorwa and du Toit, 2007); initiatives in buffer areas have been critiqued for exacerbating negative ecological impacts by acting as growth magnets and encouraging people to migrate into project areas (Scholte and de Groot, 2010); and the narrow focus of integrated projects on the relatively low-impact activities of local people has been critiqued for failing to engage with powerful external interests that may play a stronger role in driving conservation problems (Kramer et al., 1997; Oates, 1999; Terborgh, 1999).

On the human well-being side of the equation, attempts to link economic benefits to conservation and development initiatives have been criticized for not being extensive enough or quick enough in arriving; for being unable to provide the range of income-generating, labor-intensive activities that satisfy the livelihood needs of local people (Ferraro, 2001; Sayer and Campbell, 2004); for a failure to distribute benefits effectively, with benefits disproportionately going to more powerful interests rather than the poorest groups or others that actually use or rely on the natural resource in question; and for coming into conflict with existing livelihood strategies (Wells et al., 2001; Chatty and Colchester, 2002).

In general, understanding and communicating projects and policies as win–win does not provide a broad enough view of the multiple dynamics and complexities of most conservation and development scenarios. In Box 1 below, the example of national bio-fuels policy in Peru is used to illustrate how an initiative that has been framed by many as a win–win would be better understood as involving trade-offs. The example is focused on Peru, where we have been able to directly observe these dynamics, but the problems in framing bio-fuels investment as a win–win prospect are applicable in a global context.

Box 1. Biofuels in Peru: rhetoric of win–win and reality of trade-offs.

Benefit Categories	Reality of Trade-offs in Peruvian Context	
<i>Environmental conservation</i>	<i>GAIN: Cleaner and more renewable fuel source</i>	<i>LOSS: Conversion of rainforests to bio-fuel plantations</i>
	Win-win Rhetoric	
<i>Human well-being</i>	<i>GAIN: Bio-fuel jobs on plantations and in factories, new economic development</i>	<i>LOSS: Rise in food prices, water scarcity; increased land tenure conflicts</i>

In Peru, as in many countries, bio-fuels have been touted as a “win-win” for national governments, the global environment, and local job creation. In his 2010 State of the Union address, President Obama advocated increased US investment in bio-fuels using win–win rhetoric. Analyses of the impacts of bio-fuels policies on the ground, however, have highlighted some of the negative impacts that have gone along with dramatic increases in bio-fuels investments (Dammert and Canziani, 2009). According to a World Bank report, for example, 70–75% of the increase in food prices from January 2002 until June 2008 was related to bio-fuels development and the associated shifts in land use, speculative activity, and trade policies (Mitchell, 2008). Bio-fuels have been identified as a driver of large-scale deforestation in Brazil, Malaysia, and Indonesia, where forested areas have been replaced by sugar cane and palm oil monocultures (see *Friends of the Earth International*, 2008a,b). In addition to deforestation, bio-fuel production has been implicated in land tenure conflicts, food security issues, and scarce water availability for local settlers. As the trade-offs associated with investments in bio-fuels have become more and more apparent, initial enthusiasm has begun to dampen and doubt and uncertainty around the future of the industry has grown (for the Peruvian case analysis on which the above table is based, refer to Dammert and Canziani, 2009).

with human development and rights as their central focus, while fueling sentiment within certain corners of the conservation field to turn away from the plight of communities adjacent to protected areas and resume calls for a more protectionist approach (Kramer et al., 1997; Oates, 1999; Terborgh, 1999; Hutton et al., 2005). This new conservation debate has been described as taking place between “nature protectionists” defending a strong protected areas approach and “social conservationists” intent on reforming the dominant protected areas model to embrace sustainable use, ecotourism, and poverty alleviation efforts (Miller et al., 2011). The disagreements are typical of an increasing polarization of positions – it is not just indigenous people or development specialists versus conservationists, but protection versus people and parks versus development (though this debate does not seem to be affecting conservation practice and has not led to a reduction in win–win approaches).

Parts of the practitioner and academic communities are beginning to call into question the assumptions underlying win–win approaches as a result of the growing recognition that many situations on the ground involve competing, rather than complementary, social, economic, and ecological goals (Barrett and Arcese, 1995; Songorwa, 1999; Songorwa et al., 2000; Robinson and Redford, 2004; Robinson, 2011). Skeptics argue that the very idea of integrated conservation and development is conceptually flawed, and that many of the practical difficulties experienced by such approaches are the result of unrealistic assumptions about this integration and its benefits (Robinson, 1993; Songorwa, 1999; McShane and Newby, 2004).

2.3. Towards trade-offs and hard choices

Over the last few years, several writers in conservation and related areas have pointed to the importance of acknowledging and analysing trade-offs as an antidote to win–win framing (Faith and Walker, 2002; Brown, 2004; McShane and Wells, 2004; Sunderland et al., 2008). The essence of trade-off thinking is the idea that, when some things are gained, others are lost. Acknowledging trade-offs thus implies acknowledging not only the gains but also the losses – real, potential, and perceived – incurred by various choices and actions in the domains of conservation and development.

In our experience, the real power of the trade-off concept comes in its ability to bring diverse actors to the common recognition – one not forthcoming when problems are framed as win–win – that *hard choices* are being faced. *Choices*, because there are different options, each with their own suite of possible outcomes with respect to human well-being as well as the diversity, functioning and services provided by ecosystems over space and time (*Millennium Ecosystem Assessment*, 2005). *Hard*, because each choice – even the best or “optimal” one – involves loss in some way; a loss that for at least some of those affected is likely to be a significant one.

Hard choices in the conservation–development nexus are due to a variety of reasons. They are faced when there are trade-offs to be made between different interests and priorities (Brown, 2004; Winter, 2005), between long-term and short-term time horizons (where typically biodiversity conservation as a long-term objective is traded off against short-term economic benefits such as conversion to agricultural land), and between benefits at one spatial scale and costs at another. Importantly, many times choices are made implicitly, without even knowing that something is being overlooked or given up because there is a lack of knowledge or the right people are not at the negotiating table. The notion behind the push to think and communicate in terms of trade-offs is that making these more explicit will result in better designed, more resilient,

Many similar examples of the need to move beyond win–win thinking could be given. A recent review of projects supported by the Global Environment Facility (GEF, 2005) found that expectations of win–win situations proved unrealistic in most cases. Most GEF projects in the biodiversity portfolio involve some form of restriction of existing patterns of resource exploitation, which generally leads to a loss of livelihood and development opportunities for at least some individuals or groups. Indeed, the fact that many such programs also promote alternative income-generating activities such as ecotourism is an *implicit* acknowledgement of trade-off relationships, but the trade-offs involved are rarely made explicit or systematically evaluated.

2.2. Backlash to win–win

The mixed record of initiatives and policies designed to achieve win–win results has important implications for the ways in which conservation and development professionals engage with each other and the communities they work with. Frustrated expectations have led to a backlash against conservation from some groups

and more sustainable initiatives (and/or the capacity to recognize when and why this may not be possible).

2.4. Challenges to trade-offs thinking

Because so much funding has been predicated on producing win–win outcomes, acknowledging the problems with this way of thinking poses certain organizational risks. External social, political and economic forces often undercut local conservation responses, and most actors in the field have not developed the tools required to anticipate and address these larger conflicting factors. Additionally, there are few institutions able to adequately assess and distribute costs and benefits between competing interests once trade-offs are identified (Barrett et al., 2001).

Furthermore, while acknowledging that accomplishing either conservation or human well-being objectives is extremely difficult, there continues to be a general poor understanding among practitioners, in both theory and practice, of the ecological and social complexities within which conservation interventions are carried out (Brechtin et al., 2003). This incomplete theoretical understanding, traceable in part to limited integrative and interdisciplinary approaches and expertise in many conservation organizations and also to the urgency with which organizations perceive this problem, is exacerbated by the rhetorical elegance of the win–win paradigm. The win–win paradigm appeals to donors and avoids the potentially divisive political requirements of understanding and confronting explicit trade-offs between competing stakeholders (Wells and McShane, 2004; Salafsky, 2011). Even when win–win outcomes fail to materialize, there is little direct pressure for self-correction in the face of disappointing outcomes because conservation actors are not typically held accountable to those who are sometimes negatively impacted by their decisions (Jepson, 2005).

The emergence of a new paradigm and altered practice, a possible outcome of the new conservation debate, will require conservation actors to negotiate with unfamiliar interest groups and perhaps compromise on deeply held positions if they are to succeed in a complex world of contradictory perspectives. Such a shift will not be easy, but it will be necessary. In the following section, we offer a small step toward such a shift in the form of some general principles to guide and frame both the analytical and communicative challenges that will have to be overcome.

3. Some guiding principles to aid in analysing trade-offs and hard choices

Resolving, even understanding, the trade-offs between conservation and development and the hard choices they entail is difficult because the relationship (or the views people hold about this relationship) between people and nature is so strongly influenced by where they are raised, how they are educated, their life experiences and the survival conditions and options they have faced. Though these beliefs are not necessarily fixed over time and can change in the face of experience or negotiation, these different beliefs exert a strong influence on behavior. Moreover, differences in beliefs and preferences are also often linked to differences in the power to pursue goals or to make ones' voice heard.

It is generally accepted in the literature on participatory processes that no actor or organization with its own well-defined goals and preferences—and for most conservation organizations this is still the protection of biodiversity—can act as the legitimate convenor of a process designed to reconcile competing goals (Peterson et al., 2005). However, a shared foundation of guiding principles can help actors from a variety of backgrounds with multiple perspectives and different kinds of power work together to identify, analyse

and negotiate trade-off decisions, or at least to better understand the gaps that stand in the way of such decisions.

The following principles have emerged from theoretical discussions and practical engagements over the course of the Advancing Conservation in a Social Context research initiative. They have provided a foundation from which researchers and practitioners across a variety of countries, organizational contexts, and academic disciplines have been able to develop deeper understanding and better ways to discuss trade-offs in specific conservation and development initiatives and approaches. These principles were designed with the aim of being relevant, meaningful, and salient for the variety of intellectual and interest-based perspectives that intersect in complex conservation scenarios.

Each principle we propose deserves a book-length discussion. Here, our goal is to articulate them simply and in such a way that can catalyze both agreement on a place to start and an opening for discussion and more rigorous analysis. Our overall suggestion is that analytical approaches to understanding trade-offs, and attempts to communicate and discuss them, might start with a process of reflecting on these starting principles.

3.1. Basic assumptions: trade-offs and hard choices

- A. The basic definition of trade-off is that some things are gained and others lost. In conservation and development, trade-offs are the norm.
- B. A focus on trade-offs allows multiple actors to recognize the hard choices involved in conservation and development, the outcomes of which will change the diversity, functioning, and services provided by ecosystems and the range of opportunities available to people over space and time.
- C. More explicit acknowledgement of trade-offs and hard choices may lead to more resilient and sustainable conservation outcomes.

3.2. Principle 1: scale

- 1.1. Different social and ecological values manifest at different scales (Norton and Ulanowicz, 1992; Gibson et al., 2000; Levin, 2005), and trade-offs occur both within and between scales (Saunders and Briggs, 2002; Berkes, 2004; Walker et al., 2004; Giller et al. 2008).
- 1.2. Successful negotiation of trade-offs will come only with reasonable attention to political, social, economic, and ecological dynamics at multiple spatial and temporal scales, and are critically dependent on interactions across these scales.
- 1.3. In some cases, dynamics operating at one scale may prevent or constrain successful negotiation of trade-offs at another.

3.3. Principle 2: context

- 2.1. Approaches to understanding and negotiating trade-offs should respect the co-evolution of natural and human history (Agrawal and Gibson, 1999; Gjertsen and Barrett, 2004; Klein et al., 2007).
- 2.2. Analytical tools and methods should be applied with sensitivity to the political, economic, institutional and social contexts in which decisions about conservation and development occur (Hobley, 1996; Mahanty and Russell, 2002; Saunders and Briggs, 2002; Wilshusen et al., 2002; Klein et al., 2007; Robinson, 2011; Sarkar and Montoya, 2011).
- 2.3. There are no panaceas or one-size fits all solutions (Ostrom, 2007), nor are there necessarily solutions with long-term staying power (Sayer and Campbell, 2004): decisions and

strategies will have to be revisited as new knowledge emerges, and as the social, political, economic, and ecological contexts change.

3.4. Principle 3: pluralism

- 3.1. Trade-offs are experienced and understood from a variety of legitimate perspectives (Koontz and Johnson, 2004; Norton, 2005; Miller et al., 2011; Robinson, 2011). At the root of many long-standing disputes are differing models, metaphors, and ways of understanding the complexity of trade-off decisions (Endter-Wada et al., 1998; Folke et al., 1998; Gartlan, 1998; Scott, 1998; Brosius and Russell, 2003; Norton, 2005; Hirsch, 2009; Robinson, 2011).
- 3.2. Each perspective highlights certain trade-off dimensions and obscures others (Hirsch, 2009). Better formulation of problems can occur when new ways of understanding conservation and development trade-offs are developed collaboratively and iteratively with the input of multiple voices and multiple perspectives (Norton, 2005; Miller et al., 2011).
- 3.3. Diligence is necessary to ensure that the voices of all affected parties are heard, understood and respected (World Bank, 1996; Agrawal and Gibson, 1999; Mahanty and Russell, 2002; Brosius and Russell, 2003; Bozeman and Hirsch, 2006; Sarkar and Montoya, 2011).

3.5. Principle 4: complexity

- 4.1. Human and natural systems are inextricably linked (Holling, 2001; Folke et al., 2002; Wilson, 2002; Levin, 2005).
- 4.2. Many important environmental and developmental issues will always involve uncertainty (Holling, 2001).
- 4.3. All models and analytical tools for understanding conservation and development issues engage in some form of simplification of complexity, and none provide a comprehensive picture (Funtowicz and Ravetz, 1994; Holling, 2001; Brechin et al., 2003; Levin, 2005).

4. Conclusion

Win–win scenarios, where both natural resources are conserved and human well-being is improved in specific places over time, have been difficult, if not almost impossible, to realize. Compromise, contestation and conflict are more often the norm. Often hard choices need to be made between different kinds of conservation, and between conservation and human well-being, and these should be explicitly acknowledged. Not to do so leads to unrealized expectations and ultimately unresolved conflict. Conservationists need to make greater efforts to more effectively consider trade-off choices between different points-of-view, determine at what levels biodiversity loss is acceptable, mitigate human costs, and broaden the decision-making process. At the same time, development that ignores the benefits that humans derive from ecosystems and natural resources will ultimately prove unsustainable. The challenge for the conservation and development community is to engage in a social process that allows for compromise and the explicit acknowledgement of risks and costs, while at the same time gaining ever more clarity and purpose regarding those things that should not be traded off.

As new methods and approaches continue to emerge within the field of conservation, it may be important to analyse and communicate in terms of trade-offs as opposed to reverting to the natural and rhetorically powerful language of win–win. For example, man-

aging for ecosystem services, and creating payment systems for the maintenance of those services are approaches that have received substantial interest as a way of conserving natural resources and addressing livelihood issues for the rural poor (Millennium Ecosystem Assessment, 2005; Bulte et al., 2008; Wunder, 2008). While an ecosystem service approach may indeed offer a framework for better understanding and negotiating the benefits and costs of conservation, creating management or incentive systems based on this framework seems unlikely to result in ‘win–win’ outcomes any more than ICDPs or other approaches have (Sayer and Campbell, 2004; Millennium Ecosystem Assessment, 2005; Naeem et al., 2009; Redford and Adams, 2009). This does not mean they are not worth pursuing, just that the trade-offs and hard choices involved should be assessed, discussed, and debated in an honest and sober way. Our hope is that the insights and principles offered in this paper can contribute to such an approach.

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References

- Adams, W.M., Aveling, R., Brockington, D., Dickson, B., Elliott, J., Hutton, J., Vira, B., Wolmer, W., 2004. Biodiversity conservation and the eradication of poverty. *Science* 306, 1146–1149.
- Agrawal, A., 1997. Community in conservation: beyond enchantment and disenchantment. Conservation and Development Forum, Gainesville, Florida.
- Agrawal, A., Gibson, C., 1999. Enchantment and disenchantment: the role of community in natural resource conservation. *World Development* 27 (4), 629–649.
- Agrawal, A., Redford, K.H., 2006. Poverty, development and biodiversity conservation: Shooting in the dark?. WCS Working Paper No. 26. Wildlife Conservation Society, New York.
- Ambler, J., 1999. Attacking Poverty while Improving the Environment: Toward Win–Win Policy Options. Background Technical Paper. UNDP-EC Poverty and Environment Initiative. UNDP, New York and Brussels, 51 pp.
- Barrett, C.S., Arcese, P., 1995. Are integrated conservation and development projects sustainable? on the conservation of large mammals in sub-saharan Africa. *World Development* 23, 1073–1084.
- Barrett, C.S., Brandon, K., Gibson, C., Gjertsen, H., 2001. Conserving tropical biodiversity amid weak institutions. *Bioscience* 51, 497–502.
- Berkes, F., 2004. Rethinking community-based conservation. *Conservation Biology* 18, 621–630.
- Bozeman, B., Hirsch, P., 2006. Science ethics as a bureaucratic problem: IRBs, rules, and failures of control. *Policy Sciences* 38 (4), 269–291.
- Brechin, S., Wilshusen, P., Fortwangler, C., West, P., 2003. *Contested Nature: Promoting International Biodiversity and Social Justice in the 21st Century*. State University of New York Press, Albany.
- Brockington, D., Igoe, J., Schmidt-Soltan, K., 2006. Conservation, human rights and poverty reduction. *Conservation Biology* 20, 424–470.
- Brosius, J.P., Russell, D., 2003. Conservation from above: an anthropological perspective on transboundary protected areas and ecoregional planning. *Journal of Sustainable Forestry* 17 (1/2), 39–65.
- Brown, K., 2004. Trade-off analysis for integrated conservation and development. In: McShane, T.O., Wells, M.P. (Eds.), *Getting Biodiversity Projects Work: Towards More Effective Conservation and Development*. Columbia University Press, New York, pp. 232–255.
- Bulte, E.H., Lipper, L., Stringer, R., Zilberman, D., 2008. Payments for ecosystem services and poverty reduction: concepts issues and empirical perspectives. *Environment and Development Economics* 13 (3), 245–254.
- Chatty, D., Colchester, M. (Eds.), 2002. *Conservation and Mobile Indigenous Peoples: Displacement, Forced Settlement, and Sustainable Development*. Berghahn Books, Oxford.
- Chhatre, A., Agrawal, A., 2009. Trade-offs and synergies between carbon storage and livelihood benefits from forest commons. *Proceedings of the National Academy of Sciences* 106 (42), 17667.

- Cheung, W., Sumaila, U., 2008. Trade-offs between conservation and socio-economic objectives in managing a tropical marine ecosystem. *Ecological Economics* 66 (1), 193–210.
- Christensen, J., 2004. Win-win illusions: facing the rift between people and protected areas. *Conservation in Practice* 5 (1), 12–19.
- Dahlberg, A., Burlando, C., 2009. Addressing trade-offs: experiences from conservation and development initiatives in the mkuze wetlands, South Africa. *Ecology and Society* 14 (2), 37.
- Dammert, J.L., Canziani, E., 2009. Biocombustibles: elementos en Juego. *Cuestión de perspectiva* 2.
- Endter-Wada, J., Blahna, D., Krannich, R., Brunson, M., 1998. A framework for understanding social science contributions to ecosystem management. *Ecological Applications* 8, 891–904.
- Faith, D.P., Walker, P.A., 2002. The role of trade-offs in biodiversity conservation planning: linking local management, regional planning and global conservation efforts. *Journal of Biosciences* 27 (4), 393–407.
- Ferraro, P.J., 2001. Global habitat protection: limitations of development interventions and a role for conservation performance payments. *Conservation Biology* 15 (4), 1–12.
- Freese, C.H., 1998. *Wild Species as Commodities: Managing Markets and Ecosystems for Sustainability*. Island Press, Washington, DC.
- Folke, C., Berkes, F., Colding, J., 1998. Ecological practices and social mechanisms for building resilience and sustainability. In: Berkes, F., Folke, C. (Eds.), *Linking Social and Ecological Systems*. Cambridge University Press, London, UK, pp. 414–436.
- Folke, C., Carpenter, S., Elmqvist, T., Gunderson, L., Holling, C.S., Walker, B., 2002. Resilience and sustainable development: building adaptive capacity in a world of transformations. *Ambio* 31 (5), 437–440.
- Friends of the Earth International, 2008a. Malaysian palm oil—green gold or green wash? A commentary on the sustainability claims of Malaysia's palm oil lobby, with a special focus on the state of Sarawak. Friends of the Earth International.
- Friends of the Earth International, 2008b. Fuelling destruction in Latin America. The real price of the drive for agrofuels. Friends of the Earth International.
- Funtowicz, S., Ravetz, J.R., 1994. Emergent complex systems. *Futures* 26 (6), 568–582.
- Garnett, S.T., Sayer, J., Du Toit, J., 2007. Improving the effectiveness of interventions to balance conservation and development: a conceptual framework. *Ecology and Society* 12 (1), 2.
- Gartlan, S., 1998. Every man for himself and god against all: history, social science, and the conservation of nature. *Yale F&ES Bulletin* 102, 216–226.
- GEF, 2005. GEF and the Convention on Biological Diversity. Global Environment Facility, Washington, DC.
- Gibson, C.C., Ostrom, E., Ahn, T.K., 2000. The concept of scale and the human dimensions of global change: a survey. *Ecological Economics* 32, 217–239.
- Giller, K., Leeuwis, C., Andersson, J., Andriess, W., Brouwer, A., Frost, P., Hebinck, P., Heitkönig, I., van Ittersum, M.K., Koning, N., Ruben, R., Slingerland, M., Udo, H., Veldkamp, T., van de Vijver, C., van Wijk, M.T., Windmeijer, P., 2008. Competing claims on natural resources: what role for science? *Ecology and Society* 13 (2), 34.
- Gjertsen, H., Barrett, C., 2004. Context-dependent biodiversity conservation management regimes: theory and simulation. *Land Economics* 80 (3), 321–339.
- Hirsch, P., 2009. From interdisciplinary to integrative: reflections from the field. In: *International Workshop on the Philosophy of Interdisciplinarity*. Atlanta, GA. <www.philosophy.gatech.edu/pin.php>.
- Hobley, M., 1996. *Participatory Forestry: The Process of Change in India and Nepal*. Overseas Development Institute, London.
- Holling, C.S., 2001. Understanding the complexity of economic, ecological, and social systems. *Ecosystems* 4, 390–405.
- Hutton, J., Adams, W., Murombedzi, J.C., 2005. Back to the barriers?: changing narratives in biodiversity conservation. *Forum for Development Studies* 32, 341–357.
- Jepson, P., 2005. Governance and accountability of environmental NGOs. *Environmental Science and Policy* 8, 515–524.
- Klein, J., Réau, B., Kallan, I., Edwards, M., 2007. Conservation, development, and a heterogeneous community: the case of Ambohitantely Special Reserve, Madagascar. *Society and Natural Resources* 20, 451–467.
- Koontz, T., Johnson, E.M., 2004. One size does not fit all: matching breadth of stakeholder participation to watershed group accomplishments. *Policy Sciences* 37 (2), 185–204.
- Kramer, R., van Schaik, C., Johnson, J. (Eds.), 1997. *Last Stand: Protected Areas and the Defense of Tropical Biodiversity*. Oxford University Press, Oxford.
- Levin, S., 2005. Self-organization and the emergence of complexity in ecological systems. *Bioscience* 55 (12), 1075–1079.
- Mahanty, S., Russell, D., 2002. High stakes: lessons from stakeholder groups in the biodiversity conservation network. *Society and Natural Resources* 15 (2), 179–188.
- McShane, T.O., Wells, M.P. (Eds.), 2004. *Getting Biodiversity Projects Work: Towards More Effective Conservation and Development*. Columbia University Press, New York.
- McShane, T.O., Newby, S.A., 2004. Expecting the unattainable: the assumptions behind ICDPs. In: McShane, T.O., Wells, M.P. (Eds.), *Getting Biodiversity Projects Work: Towards More Effective Conservation and Development*. Columbia University Press, New York, pp. 49–74.
- Millennium Ecosystem Assessment, 2005. *Ecosystems and Human Well-being: Synthesis*. Island Press, Washington, DC.
- Miller, T.R., Minter, B.A., Malan, L.C., 2011. The new conservation debate: a descriptive and normative analysis. *Biological Conservation* 144, 948–957.
- Mitchell, D., 2008. A Note on Rising Food Prices. Policy Research Working Paper No. 4682. The World Bank. Development Prospects Group.
- Naeem, S., Bunker, D., Hector, A., Loreau, M., Perrings, C. (Eds.), 2009. *Biodiversity, Ecosystem Functioning, and Human Wellbeing: An Ecological and Economic Perspective*. Oxford University Press, Oxford.
- Nelson, E., Mendoza, G., Regetz, J., Polasky, S., Tallis, H., Cameron, R., Chan, M.A., Daily, G., Goldstein, J., Kareiva, P., Lonsdorf, E., Naidoo, R., Ricketts, T., Shaw, M.R., 2009. Modeling multiple ecosystem services, biodiversity conservation, commodity production, and tradeoffs at landscape scales. *Frontiers in Ecology and the Environment* 7 (1), 4–11.
- Norton, B.G., 2005. *Sustainability: Philosophy of Adaptive Ecosystem Management*. University of Chicago Press, Chicago.
- Norton, B.G., Ulanowicz, R.E., 1992. Scale and biodiversity policy: a hierarchical approach. *Ambio* 21, 244–249.
- Oates, J.F., 1999. *Myth and Reality in the Rain Forest: How Conservation Strategies are Failing in West Africa*. University of California Press, Berkeley.
- OECD, 1996. *Shaping the 21st Century: The Role of Development Co-operation*. OECD, Paris.
- Ostrom, E., 2007. A diagnostic approach for going beyond panaceas. *Proceedings of the National Academy of Sciences* 104 (39), 15181.
- Peterson, M.N., Peterson, M.J., Peterson, T.R., 2005. Conservation and the myth of consensus. *Conservation Biology* 19, 762–767.
- Redford, K.H., Richter, B., 1999. Conservation of biodiversity in a world of use. *Conservation Biology* 13 (6), 1246–1256.
- Redford, K.H., Fearn, E., 2007. *Protected Areas and Human Livelihoods*. WCS Working Paper No. 32. Wildlife Conservation Society, New York.
- Redford, K.H., Adams, W.M., 2009. Payment for ecosystem services and the challenge of saving nature. *Conservation Biology* 23 (4), 785–787.
- Robinson, J.G., 1993. The limits to caring: sustainable living and the loss of biodiversity. *Conservation Biology* 7 (1), 20–28.
- Robinson, J.G., 2011. Ethical obligations, pragmatism, and sustainability in real world conservation. *Biological Conservation* 144, 958–965.
- Robinson, J.G., Redford, K.H., 2004. Jack of all trades, master of none: Inherent contradictions among ICDP approaches. In: McShane, T.O., Wells, M.P. (Eds.), *Getting Biodiversity Projects Work: Towards More Effective Conservation and Development*. Columbia University Press, New York, pp. 10–34.
- Roe, D., 2008. The origins and evolution of the conservation-poverty debate: a review of key literature, events and policy processes. *Oryx* 42, 491–503.
- Salafsky, N., 2011. Integrating development with conservation: a means to a conservation end, or a mean end to conservation? *Biological Conservation* 144, 973–978.
- Sanderson, E.W., Jaiteh, M., Levy, M.A., Redford, K.H., Wannebo, A.V., Woolmer, G., 2002. The human footprint and the last of the wild. *Bioscience* 52 (10), 891–904.
- Sanderson, S.E., 2005. Poverty and conservation: the new century's "peasant question?". *World Development* 33, 332.
- Sandker, M., Campbell, B.M., Nzooh, Z., Sunderland, T., Amougou, V., Defo, L., Sayer, J., 2009. Exploring the effectiveness of integrated conservation and development interventions in a Central African forest landscape. *Biodiversity and Conservation* 18 (11), 2875–2892.
- Sarkar, S., Montoya, M., 2011. Beyond parks and reserves: The ethics and Politics of conservation with a case study from Peru. *Biological Conservation* 144, 979–988.
- Saunders, D.A., Briggs, S.V., 2002. Nature grows in straight lines – or does she? What are the consequences of the mismatch between human imposed linear boundaries and ecosystem boundaries? An Australian example. *Landscape and Urban Planning* 61, 71–82.
- Sayer, J., Campbell, B., 2004. *The Science of Sustainable Development: Local Livelihoods and the Global Environment*. Cambridge University Press, Cambridge.
- Scholte, P., de Groot, W.T., 2010. From debate to insight: three models of immigration to protected areas. *Conservation Biology* 24 (2), 630–632.
- Scott, J., 1998. *Seeing Like a State: How Certain Schemes to Improve the Human Condition have Failed*. Yale University Press, New Haven.
- Songorwa, A.N., 1999. Community-based wildlife management (CWM) in Tanzania: are the communities interested? *World Development* 27 (12), 2061–2079.
- Songorwa, A.N., Buhrs, T., Hughey, K.F.D., 2000. Community-based wildlife management in Africa: a critical assessment of the literature. *Natural Resources* 40 (3), 603–643.
- Songorwa, A.N., du Toit, M., 2007. Hunting in Tanzania: has science played its role? *Tanzania Journal of Agricultural Sciences* 8 (1), 31–37.
- Sunderland, T., Ehringhaus, C., Campbell, B.M., 2008. Conservation and development in tropical forest landscapes: a time to face the trade-offs? *Environmental Conservation* 34 (4), 276–279.
- Terborgh, J., 1999. *Requiem for Nature*. Island Press, Washington, DC.
- Walker, B., Holling, C.S., Carpenter, S., Kinzig, A., 2004. Resilience, adaptability and transformability in social–ecological systems. *Ecology and Society* 9 (2), 5–13.
- Wells, M., Guggenheim, S., Khan, A., Wardojo, W., Jepson, P., 1999. *Investing in Biodiversity: A Review of Indonesia's Integrated Conservation and Development Projects*. The World Bank, Washington, DC.
- Wells, M.P., Ganapin, D.J., Uitto, J.I., 2001. *Medium-Sized Projects Evaluation: Final Report*. Evaluation Report #2-02. Global Environment Facility, Washington, DC.
- Wells, M.P., McShane, T.O., 2004. Integrating protected area management with local needs and aspirations. *Ambio* 33, 513–519.

- Wilshusen, P., Brechin, S., Fortwangler, C., West, P., 2002. Reinventing a square wheel: critique of a resurgent 'protection paradigm' in international biodiversity conservation. *Society and Natural Resources* 15, 17–40.
- Wilkie, D.S., Morelli, G.A., Demmer, J., Starkey, M., Telfer, P., Steil, M., 2006. Parks and people: assessing the human welfare effects of establishing protected areas for biodiversity conservation. *Conservation Biology* 20, 247–249.
- Wilson, J., 2002. Scientific uncertainty, complex systems, and the design of common-pool institutions. In: Ostrom, E., Dietz, T., Dolšak, N., Stern, P.C., Stonich, S., Weber, E.U. (Eds.), *The Drama of the Commons*. National Academy Press, Washington, DC, pp. 327–360.
- Winter, H., 2005. *Trade-offs: An Introduction to Economic Reasoning and Social Issues*. University of Chicago Press, Chicago.
- World Bank, 1996. *The World Bank participation sourcebook*. The World Bank, Washington, DC.
- Wunder, S., 2008. Payments for environmental services and the poor: concepts and preliminary evidence. *Environment and Development Economics* 13 (3), 279–297.