Review Article

Conservation Science and Practice Must Engage With the Realities of Complex Tropical Landscapes

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Abstract

There is a growing disconnect between the international conferences where grand solutions for tropical conservation are designed and the complex local realities in tropical landscapes where plans need to be implemented. Every tropical landscape is different and no "one size will fit all." There is a tendency for global processes to prescribe simple generalized solutions that provide good sound bites that can be communicated with political actors and the media. Sustainable outcomes in tropical landscapes require locally adapted, unique approaches supported by long-term processes of learning and adaptation. Tropical biologists and conservationists can play a key role by establishing effective local–global links and by directly engaging in local policy discourses while remaining connected to evolving political imperatives.

Keywords

conservation impact, forest science–policy disconnects, integrated landscape conservation, applied conservation science, international conservation policies, tropical landscapes

Development and Change in Tropical Landscapes

Landscapes throughout the tropics are changing rapidly and dramatically. Increasing international demand for commodities is leading to large-scale conversion of forests to agriculture and tree crops (Lambin & Meyfroidt, 2011; Rudel, 2007). Decentralization of forest governance and human population movements have drastically increased the diversity of stakeholders in many forest landscapes (Boedhihartono, 2017; Pacheco et al., 2010) and added to the complexity of these social–ecological systems (Liu et al., 2007). Contemporary tropical forest landscapes consist of mosaics of land uses, vegetation types, diverse stakeholder interests, development initiatives, and conservation interventions.

Highly dynamic socioeconomic and environmental situations require conservation interventions to be adaptive and flexible; one size will not fit all. Conservation practitioners need to employ patient processes of

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stakeholder consultation, learning, negotiation, and compromise (Putz & Zuidema, 2008; Sayer, 2009). Conservation increasingly has to confront the challenge of "wicked" problems (Balint, Stewart, & Desai, 2011), where even reaching agreement on the nature of the problem is difficult. Thus, conservation possesses characteristics of jazz: It is a constant process of improvisation but with an agreed syncopation but a contested end point (Sayer & Campbell, 2004; Sayer et al., 2008). Good jazz requires that the players have a strong sense of the other instruments that make up the orchestra. Similarly, scientists need a refined sense of the roles and values of scientists from the different disciplines that can contribute to creating a whole that is greater than the sum of the parts.

Successful conservation in tropical landscapes must be a long-term process. Social dynamics, market incentives, and environmental pressures are constantly changing, and today's solutions may not appeal to tomorrow's population or may not even be appropriate for tomorrow's challenges (Redford, Padoch, & Sunderland, 2013). Solving on-the-ground problems requires long-term engagement, deep local knowledge, strong social networks, and the flexibility to try new things while learning and adapting or "muddling through" (Lindblom, 1959; Sayer et al., 2008). Unfortunately, there are numerous examples of well-planned, externally designed conservation projects that have little impact or longevity beyond the duration of their short-term funding cycles (Sayer & Wells, 2004).

Enabling Policies for Conservation in Tropical Landscapes

Many conservation initiatives are failing to achieve traction in improving conservation outcomes in the tropics. Recent decades have seen the emergence of numerous global initiatives seeking to set priorities and identify pathways to conserve tropical ecosystems. High-level policy processes reflect a tendency to centralize conservation thinking and a belief that easy globally applicable solutions can be identified. Over-centralization of the debate tends to encourage issue cycles where international attention goes through periods of excessive concentration on simple short-term solutions to what are, in reality, very complex long-term problems (Turnhout et al., 2017). Issue cycles trigger practical interventions focusing on individual components of complex systems but do not necessarily foster an integrated approach to solving the problems of the system as a whole. Research funding often follows these issue cycles, and it is easier to fund research on components of forest systems rather than on entire systems. We use the term "Whack a mole" to describe this continuous switching of attention from one perceived solution to another (Marx, 2009). Whack a mole is an arcade game where the participant stands before a board that has a number of holes in it. An artificial mole emerges randomly, unpredictably, and increasingly quickly from the holes, and the contestant has to hit it with a wooden mallet. We see similarities in the way in which forest policy processes operate. The international forest discourse has generated a series of whack a mole interventions focusing on issues such as shifting agriculture, bioprospecting, illegal logging, forest certification, payments for environmental services, REDD+, and so on. Research investments have tended to align with these issues. Simple solutions to these problems have been advocated when the reality is that in isolation none of them could achieve the desired outcomes. Progress is needed on all of these issues, and others, and solutions will still be difficult in the absence of robust institutions and an ability to enforce decisions and agreements. Turnhout et al., (2012) have argued that the recently established International Platform on Biodiversity and Ecosystem Services (IPBES) is seeking global generalizations and will face the challenge of aligning solutions with local realities. It is encouraging to note that IPBES is now giving more attention to integrated solutions that include social, economic, and political dimensions of problems. Simple generalized policies and initiatives, packaged in politically correct and emotionally appealing terms, are attractive to political decision makers and funding agencies (Redford et al., 2013), but their links to practical realities on the ground are often tenuous (Thomas, Dargusch, Harrison, & Herbohn, 2010).

Clearly, globally established policies are not delivering their desired results (Butchart et al., 2010; Ferraro & Pattanayak, 2006; Neudert, Ganzhorn, & Wätzold, 2017). We argue that those responsible for developing conservation policy are insufficiently attuned to local realities and contexts, while those with local knowledge are unable to make their voices heard at the global decision-making table. Delegations of indigenous people attend global policy fora, but their presence may only lead to platitudes in concluding statements. We doubt that they have much influence on political decisions. For instance, at the 2016 Global Landscapes Forum, Hindou Oumarou Ibrahim, Coordinator for the Indigenous Women and People's Association of Chad, lamented that discussions at conferences of parties of the UN Framework Convention on Climate Change on the value of traditional ecological knowledge were taking place without adequate representation from indigenous people. She maintained that "global commitments are not saving local lives."

Decentralized Management but Centralized Policy and Science

We argue that those responsible for designing global tropical conservation strategies do so at a scale far

removed from local realities. The left triangle in Figure 1 illustrates a scenario that we believe existed some decades ago where the majority of conservation decision-making was relatively decentralized.

Most of the authors of this article began our careers with long-term assignments as field researchers in developing countries where we worked alongside conservation managers. At that time, international conservation policies were developed by small groups of experts (the upward tip of the triangle) most of whom had a history of in-depth, long-term field experience as scientists or conservation practitioners. In contrast, contemporary international policy processes (right triangle) are populated by elite professional negotiators and diplomats (upper side of triangle) who have limited practical experience in tropical forest landscapes. High-level decision makers can often lack "subject area competence." Local practitioners, governments, and nongovernmental organizations (NGOs) have limited capacity to influence international fora (the downward tip of the triangle). Large civil society gatherings occur on the fringes of most global conservation events, but the real decisions are made by a core of politicians, diplomats, and the heads of industry who determine investment patterns.

Over the past decades, there has been a strong movement to decentralize natural resource management to local—landscape—levels, but this has occurred at a time when there has been a marked centralization of research capacity and policy making. In the recent past, there were many well-funded, permanent research facilities in key biodiversity areas in the tropics, for instance, in Eastern Africa and Southeast Asia. Many of these have experienced declining funding, and several have been forced to cease operating. The Center for International Forestry Research in Bogor Indonesia was a valuable initiative to counter this trend, but it also struggles to maintain funding for its activities in the tropics. Core funding has decreased over the lifetime of the center from 100% in the mid-1990s to just 7% in 2017—the remainder of funding now coming from bilateral grants and other sources.

The incentives and rewards for researchers now encourage them to move to elite research centers and universities where their performance is assessed against their publications in high-impact journals. Gossa, Fisher, and Milner-Gulland (2015) have claimed that practitioners and researchers from developing countries are skeptical about the role of elite peer-reviewed publications. Some tropical countries have placed restrictions on international researchers some of whom they perceive as pursuing an agenda which is not consistent with their national sovereignty. The reality is that major concentrations of influential tropical conservation scientists are increasingly found in rich world academic institutions. Major tropical research capacity is now found in Cambridge, UK; Wageningen, the Netherlands; the

Figure 1. The changing weights of local realities and global forums in setting tropical conservation policies. Until the 1980s, tropical conservation policies were formulated by a small group of experts with long-term involvement in tropical landscapes (left). Nowadays, these policies are developed during large-scale and frequent international meetings attended by elite negotiators without such long-term involvement and without connections with local realities (right). Drawing by Agni Klintuni Boedhihartono.

University of Florida, Gainesville; Duke University in the United States; and several other locations in the developed countries. The center of gravity of tropical conservation science has shifted northward. Conservation management agencies in low-income tropical countries often have little research capacity and are less influenced by peer-reviewed publications (Gossa et al., 2015). Field research is increasingly conducted by ''fly in–fly out'' scientists, often termed ''safari scientists.'' International conservation NGOs fund research, but they are also constrained to use their core resources to support their central superstructures and staff who ensure the organizations visibility at international conferences. These organizations often have to fall back on short-term, soft money to support field research, and many are not considered eligible for funding from mainstream research councils and foundations. Career pathways for conservation scientists do not favor long-term local engagement, and their research is increasingly disconnected from the people responsible for day-to-day management of practical conservation.

Arguably, there are more conservation problems and more global conservation initiatives now than 30 years ago, and this requires more ''thinking and talking heads'' around negotiation tables. But with declining connection to local realities, the policies emerging from these processes are likely to fail. We are not advocating a return to the former expert-driven model but rather suggesting that both models are suboptimal, and there is a need to move toward an integrated model of knowledge co-production where management is a process of experimentation and learning. Managers and scientists need to work together to understand patterns and causal relations that determine the performance of forest landscapes in delivering the appropriate balance of goods and services for society.

Enhanced feedback is needed between international and national conservation ''designers'' and those who have to implement their decisions in tropical landscapes. There is a need to learn what works and what does not in messy local contexts and to understand the effects of conservation interventions on both nature and people (Laurance et al., 2012; Sutherland, Pullin, Dolman, & Knight, 2004). Top-down conservation policies need to receive feedback from on-the-ground impacts. Evidence-based conservation should become the rule rather than the exception. Yet, so far, evidence is poorly evaluated, negative findings are often suppressed, and there is little reflection on the outcomes of interventions (T. C. H. Sunderland, Sayer, & Hoang, 2012). Such failure to provide robust, objective analysis of the impacts of interventions severely compromises our ability to determine optimal pathways for conservation.

A Changing Role for Conservation Scientists

We see three important roles for tropical biologists, foresters, and conservation practitioners in reconnecting global policy development forums with the local realities of tropical landscapes. Incentives for younger scientists must encourage long-term engagement with conservation management practitioners at the landscape scale. Scientists and conservation practitioners must be more directly involved in local decision-making on conservation interventions, in negotiating compromises, and in adapting to change (Sayer & Campbell, 2004; Sayer et al., 2013). Long-term commitment helps to establish the wide base of the left triangle in Figure 1.

A second role is for these locally engaged professionals to report on their experiences of conservation interventions. Monitoring and reporting should critically analyze both successes and failures. Scientists and conservation practitioners need to be ''honest brokers of policy alternatives'' or ''science arbiters''—essentially providing objective, empirical evidence that can inform, or expand upon, the knowledge available to decision makers (Pielke, 2007). This is not easy, as choices in conservation are often made based on values, culture, and opinion rather than an objective evaluation of alternatives. Conservation scientists have a strong tendency to be ''issue advocates'' and to prove that biodiversity conservation will be the best option for alleviating local poverty. This flies in the face of compelling realities that show that in the absence of financial transfers forest protection is rarely the best option for local people. The more scientists are geographically and culturally disconnected from local realities the stronger and less well informed their issue advocacy becomes. Conservation science must be redeployed from global academic hot spots to local biodiversity hot spots. Education, training, and research capacity must be deployed so as to foster direct cultural links to the geographies concerned (Samndong, Bush, Vatn, & Chapman, 2018). We argue that tropical conservation and the development of effective international conservation policies are better served if scientists act as honest brokers than if they are ''issue advocates'' (Huitema & Turnhout, 2009). While acknowledging that effectively utilizing honest brokers is not without its own challenges, ultimately, we expect brokers to be more greatly valued by decision makers and to be more likely to come up with solutions that will be locally sustainable.

We believe that those practically engaged in conservation can play an important role in reestablishing connections with international policy makers by assuring that their experiences are heard and read. Elite conservation scientists and high-impact journals favor reductionist science. Metastudies of single factor influences on forests are more likely to be accepted by journals than studies

that attempt to unravel the complexity of local landscape realities. Inconclusive studies of wicked problems appear to perplex journal editors who are looking for simple causal relationships. We argue that it is precisely this complexity and the wicked nature of many conservation problems that needs to be better communicated to global negotiators. Negotiators trade in sound bites and messages with emotional appeal tailored to the mass media. Bull, Elliott, Boedhihartono, and Sayer (2014) provide examples of astonishingly naive statements on tropical forest conservation made by global leaders at international fora.

Conservation scientists must have a seat at the local policy-making table where they can join NGOs and act as boundary agents in linking the global discourse with local realities (Clark et al., 2016; Leach, Stirling, & Scoones, 2010). Many field scientists are active in the international policy arena but often do so to promote their interests and raise money and may be reluctant to report on failures (Ferraro & Pattanayak, 2006; Fisher et al., 2014). International negotiators have to be prepared to learn that many of their solutions are not working in practice (Fisher et al., 2014). Rigorous and value neutral studies of the local impacts of global policies must be communicated to the global negotiators in addition to being published in scientific journals, on conservation websites, and in the general media (Sunderland, Sunderland-Groves, Shanley, & Campbell, 2009).

International scientific journals covering conservation issues are failing to reconnect international policy with local conservation practice. There is a failure to report objectively on the success, failure, effects, and problems of interventions; evaluate the effectiveness of international policies at local level; and focus research on questions of local significance. We need to be especially forthcoming in reporting our failures—by doing so, we can avoid repeating them and provide feedback to inform future processes of adaptive governance (Reed, Van Vianen, Barlow, & Sunderland, 2017; Sunderland et al., 2009). We welcome initiatives to make lessons learned more visible (e.g., www.environmentalevidence.org) but regret that such publications bring little merit in advancing academic careers.

Conservation organizations are improving the effectiveness of interventions by encouraging small-scale field testing of new ideas and approaches and presenting them as policy solutions at larger scales. However, funding agencies are often reluctant to allocate resources to conservation interventions that are experimental or that challenge conventional wisdom. Aid agencies, in particular, claim that they want to support bottom-up programs and that they want evidence to demonstrate impact. The harsh reality is that Aid agencies want ''bottom-up'' to be defined in their own terms, and if the evidence does not match their expectations, they will be reluctant to continue funding.

Conclusions

Achieving tropical conservation is a complex challenge that requires adaptive, flexible, and long-term engagement of conservation scientists on the ground. In addition, it requires global conservation policies that can provide an enabling environment for locally adapted solutions. International action will not be effective at local levels if the disconnect persists between international events where grand solutions are designed, and the complex, messy tropical landscapes where interventions actually take place. Conservation science is becoming increasingly detached from local realities. The loci of experimentation, learning, decision-making, and adaptation need to move to a more local level. Incentives and career pathways for scientists must reward those who choose to operate in the field. A generation of scientists is needed that pursue their careers embedded in conservation practice. We are witnessing diminishing practical returns to elite science and simplistic sound-bite policy making. There is an urgent need to reconnect the global to the local.

Principles, guidelines, and tools for adaptive conservation at local scales—often referred to as a ''landscape approach''—are now gaining recognition in science and practice (DeFries & Rosenzweig, 2010; Reed et al., 2016; Sayer et al., 2013) and are increasingly adopted by conservation practitioners. Landscape approaches attempt to engage conservation with local realities and contexts. Evidence for the impact of these approaches remains elusive (Reed et al., 2017; Sayer et al., 2016) perhaps because funding for these approaches is often not maintained for long enough. Landscape approach practitioners are often not optimally aligned with national sectoral and jurisdictional networks. The true loci of decision-making are still excessively centralized. We look to a future where strategies and decisions are produced by those whose lives will be impacted (Adams, 2016). We see landscape approaches as having the potential to bring together scientists, decision makers, and local actors to achieve this.

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