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Have integrated landscape approaches reconciled societal and environmental issues in the tropics?

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ABSTRACT

Landscape approaches to integrated land management have recently gained considerable attention in the scientific literature and international fora. The approach is gaining increasing support at governmental and intergovernmental levels, as well as being embraced by a host of international research and development agencies. In an attempt to determine whether, and how, these approaches compare with previous conservation and development paradigms, we reviewed the implementation of integrated landscape approaches across the tropics. Within the scientific literature we fail to find a single applied example of the landscape approach in the tropics that adequately—that is with reliable, in depth collection and reporting of data—demonstrated the effective balancing of social and environmental trade-offs through multi-scale processes of negotiation for enhanced outcomes. However, we provide an assessment of 150 case studies from unpublished grey literature and 24 peer-reviewed studies that exhibit basic characteristics of landscape approaches. Our findings indicate that landscape approaches show potential as a framework to reconcile conservation and development and improve social capital, enhance community income and employment opportunities as well as reduce land degradation and conserve natural resources. However, comprehensive data on the social and environmental effects of these benefits remain elusive. We identify key contributing factors towards implementation, and progress, of landscape approaches and our findings suggest that multi-level, or polycentric, governance structures relate well with intervention success. We conclude that landscape approaches are a welcome departure from previous unsuccessful attempts at reconciling conservation and development in the tropics but, despite claims to the contrary, remain nascent in both their conceptualization and implementation.

1. Introduction

Landscape approaches to integrated land management have recently gained considerable attention in the scientific literature and international fora (Sayer et al., 2013; Kusters, 2015; Reed et al., 2016) and represent the latest in a series of attempts to reconcile broad-scale conservation and development objectives (Glamann et al., 2015; Reed et al., 2016). With the aim of enhancing social and environmental outcomes, there is increasing support for the integration of previously distinct sectors such as agriculture, energy, forestry, and industrial supply chains to manage land and resources more sustainably. The landscape approach is appealing as a framework because it explicitly calls for the engagement of multiple stakeholders from across sectors to better negotiate trade-offs and maximize synergies within the landscape (Görg, 2007; Sayer et al., 2013; Chia and Sufo, 2015). The approach has been adopted and recognized at governmental (Indonesia, for example) and intergovernmental levels (Convention on Biological Diversity, United Nations Environment Programme), as well as being embraced by a host of international research and development agencies and non-governmental organizations. Yet despite this growing theoretical support for the landscape approach as a concept, there remains both a lack of consensus on definition and limited attempts to apply these approaches on the ground (Pfund, 2010; Scherr et al., 2013; Chia and Sufo, 2015). Furthermore, it has recently been suggested that the approach remains under-theorized (Reed et al., 2016) and that there is a lack of evidence of the effectiveness of the approach in practice (Sayer et al., 2016a). To determine to what extent landscape approaches differ from previous concepts

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that sought to reconcile conservation and development agendas, we reviewed their implementation, and maintenance, across the tropics. Essentially, we wanted to consider whether landscape approaches represent an important, novel conceptualization of how conservation and development can be more holistically realized, or are they merely a re-branding of old ideas (Redford et al., 2013)?.

Landscape approaches are primarily rooted in conservation and the science of landscape ecology (Forman, 1995; Lindenmayer et al., 2008; Sayer, 2009). Biodiversity conservation in particular has been addressed in a "landscape context" over recent decades (cf. Sunderland et al., 2012). Despite the emphasis on reserves and protected areas in the 1980s, some authors were introducing the concept of landscapes into the conservation narrative (Forman and Godron, 1981; Noss, 1983), and early conservation theory promoted landscape-scale thinking through the principles of island biogeography (Kingsland, 2002), albeit not without criticism (Margules et al., 1982). Concurrently, systems approach thinking was developing new ways to manage common pool resources (Ostrom, 1990). The expanded focus of conservation efforts in the late 1980s and early 90s—driven by international agendas such as the Brundtland report (Brundtland et al., 1987) and the largely universal acceptance of the requirement for sustainable development (Schubert and Láng, 2005)—to move beyond protected areas and integrate broader societal needs and aspirations led to the design of "integrated development and conservation projects" (ICDPs) (Hughes and Flintan, 2001). However, the much anticipated "win-win" outcomes remained hard to achieve (or even measure) and often resulted in win-lose or even lose-lose scenarios for both conservation and development agencies (Wells and McShane, 2004). ICDPs were lamented as being too localized in focus—often targeting buffer zones surrounding protected areas—and heavily biased towards achieving conservation targets alone (Sunderland et al., 2012). Such a focus was regarded as sub-optimal for improving rural economic development (McShane et al., 2011), could lead to unforeseen environmental degradation (Garnett et al., 2007; Wells and McShane, 2004), and failed to take into account the inherent trade-offs between social and environmental concerns (Sunderland et al., 2008).

Recent decades have seen the development of a variety of landscape frameworks by multiple authors (Frost et al., 2006; Fischer et al., 2008; Sayer et al., 2013; Ros-Tonen et al., 2014; Freeman et al., 2015), with the aim of embedding single-sector conservation, agricultural production and other land uses within broader landscape-scale management strategies. Such approaches are epitomized by the "Ecosystem Approach" of the Convention on Biological Diversity, but also include a plethora of landscape-scale initiatives developed by multiple development agencies and conservation NGOs – for example: integrated water resource management, integrated rural development, and forest landscape restoration to name a few. More recently, the emerging interdisciplinary field of sustainability science has strengthened the call for improved integration between research disciplines, policy, and practice to better comprehend the complexities—and connectedness—of interactions between human and environmental systems (Kates et al., 2001; Clark, 2007). As developments in landscape-scale management strategies continue to emerge, the sheer volume of approaches has resulted in a somewhat florid and confusing terminologies, that has been suggested as a contributing factor inhibiting progress on implementation (Scherr et al., 2013; Waylen et al., 2014; Mastrangelo et al., 2014; Reed et al., 2016). This has arguably led to fragmentation of knowledge, unnecessary re-invention of ideas and practices, and slow progress in gaining policy traction (Scherr et al., 2013).

To contribute to a resolution of this confusion, it is seemingly important to define what a landscape approach is, and what it is trying to achieve. This is, however, far from straightforward as landscape approaches, and even the term landscape itself, will mean different things to different actors (Tress et al., 2001). A 'landscape' can refer to either spatial and ecological characteristics that help define conservation and development targets, or to governance and other social interactions and mechanisms that minimize conservation and development trade-offs (Redford et al., 2003). A landscape approach can be defined as a framework to integrate policy and practice for multiple competing land uses through the implementation of adaptive and integrated management systems (Reed et al., 2015). However, as landscapes, their individual components, and the stakeholders within and around them are unique and dynamic, a single management framework applied at the landscape scale cannot be expected to be successfully applied across different landscapes. Such frameworks that are proven to be optimal in one landscape may well be sub-optimal in another and implementers must be cognizant of the context specific nuances of their landscape of interest (Ward and Shackleton, 2016). A landscape approach is best considered as a process—as opposed to a project—but in order to progress towards "outcome" objectives, it is important to recognise what those objectives are, who defines them, and what mechanisms can facilitate progress towards them.

The general overarching objectives of the landscape approach are enhancing sustainability and multi-functionality within the landscape to achieve multiple outcomes. Sustainability should encompass social, economic, environmental, cultural, and often political objectives and relate to the ability of the system of interest to increase resistance to stochastic changes and resilience to future shocks—whether natural or market-induced. Meanwhile multi-functionality can refer to spatial segregation (the configuration of separate land units with different functions); temporal segregation (different functions on the same unit of land over time); or functional integration (multiple concurrent functions operating on the same unit of land) (Brandt, 2003). The landscape approach is more often related to functional integration or "real multi-functionality" and therefore implementation efforts should address the complexity of balancing the objectives of multiple stakeholders—potentially across a range of sectors (e.g. extractive resources to forest conservation) and scales (e.g. indigenous community to multi-national industry or policy) (see also: De Groot, 2006; Scherr and McNeely, 2008; O'Farrell and Anderson, 2010; Freeman et al., 2015). The key to landscape approach effectiveness or progress therefore, is understanding, and balancing, the needs and aspirations of landscape stakeholders, appreciating that perceptions of what defines success will vary amongst stakeholders, and incorporating these into formal or informal decision-making processes. This allows the identification of situations where trade-offs and synergies are likely to occur, facilitating negotiation and the application of appropriate adaptive management mechanisms. Such regular processes of consultation should seek to aid the navigation of landscape change, ideally reducing vulnerability while enhancing resilience (Folke et al., 2010). However, we acknowledge that much of the complexity is likely beyond the realms of management, and a degree of "muddling through" will invariably be necessary (Lindblom, 1959; Sayer et al., 2008).

Here, we aim to contribute to a better understanding of the practicalities of implementing a landscape approach and the mechanisms required for an effectively functioning process; thereby contributing to the ongoing discourse on reconciling conservation and development by evaluating to what extent landscape approaches represent a departure from the much-criticized prior interventions. To achieve this, we critically reviewed both the scientific peer-reviewed and non-published (grey) literature to determine 1) where terrestrial landscape approaches have been applied in the tropics, 2) whether conservation and development objectives have been integrated with successful outcomes for both,

3) whether landscape approaches have been effective in securing societal and environmental improvements (if any), 4) which components of landscape approaches have contributed towards these improvements, and 5) what are the governance structures in place.

The tropics represent a highly relevant focus area as they contain many globally significant biodiversity hotspots (Myers et al., 2000) but also often exhibit high levels of social and political complexity and dynamism (Wilshusen et al., 2002). While the review process cannot uncover all of the evidence related to integrated landscape approaches, we understand this process to be the first attempt to aggregate the existing published—and grey—scientific knowledge on the subject. As such, this review can complement local knowledge and other reviews that engage more directly with practitioners on the ground (Estrada-Carmona et al., 2014; Milder et al., 2014; Kusters, 2015). Ultimately, we aim to help inform the development of a clear strategy on landscape-scale management, contribute to the integration of conservation, agriculture and other land uses into future land-use policies and identify how landscape approaches can be best implemented to support national commitments towards the Sustainable Development Goals (Van Vianen et al., 2015) (https://sustainabledevelopment.un.org).

2. Methods

This review of landscape approach case studies in the rural tropics is based upon a robust and thorough systematic assessment of both the peer-reviewed and grey literature. This involved analysing 16,832 peer-reviewed articles retrieved from searches performed in September 2014 and updated in November 2015 using the specialist databases Web of Knowledge, the Centre for Agriculture and Bioscience International (CABI), and Scopus, with Google and Google scholar used to test for completeness. A total of 488 grey literature documents were retrieved via a number of methods: a specific call for grey literature distributed to: key research organisations (see supplementary material for details), the listserv Biodiversity-L, and international conferences (Global Landscapes Forum, Association for Tropical Biodiversity Conservation, World Forestry Congress); screening the websites of key research organisations (as above) using the search string: site: file:pdf ("landscape approach"|"multifunctional landscapes"|"sustainable agriculture"|"environment and development reconciliation"); identification of documents via the author group and partners (snowballing method); bibliography screening of relevant peer and non-peer-reviewed articles (see: Reed et al., 2015 for a detailed methodology).

At the outset of the review, the inclusion criteria was necessarily rudimentary (see Table 1). However, completing a systematic review is an iterative process and modifications to the protocol may be necessary (Moher et al., 2014). We found this to be the case as due to inconsistencies in use of terminology and a lack of a universal definition for landscape approaches, screening of full text articles became increasingly subjective when limited to the initial criteria. As a result, the review team had multiple consultations throughout the screening process, discussed issues with other experts in the field and ultimately used our collective judgement to determine inclusion. Table 1 presents both the initial (applied to all articles at title and abstract screening) and amended inclusion criteria (applied to all articles at full text screening). It is important to note here that studies that conformed to the initial criteria would be included in the review. The amended criteria was developed more as a guide for the reviewers and to encourage more detailed data extraction at full text screening. While it was hoped for, it was not a requirement that studies must meet all of these amended criteria in order to be included. All studies were reviewed by at least two reviewers and if consensus between the two reviewers was failed to achieve with regard to study inclusion, a third review would be completed before a consultation to determine inclusion.

Table 1
initial and adapted screening criteria for all peer-reviewed studies examined.

Initial inclusion criteria	**Study aims to**: balance competing sectorial or stakeholder demands on land at the landscape scale within the tropics **Study documents**: • evidence of integrating at least two land uses • evidence of integrating at least two stakeholders • outcomes on social, agronomic, environmental, or economic variables
Amended inclusion criteria	**Study details:** an attempt to reconcile social and environmental objectives at the landscape scale. **NB:** We do not provide a set scale, or spectrum of scales, that would define a landscape but rather suggest that the landscape is a socio-ecological system that is large enough to display heterogeneity of land characteristics and small enough to maintain a degree of manageability (Berkes and Folke, 1998; Ostrom, 2009; Torquebiau, 2015; Denier et al., 2015) **Study aims to:** • integrate agriculture and forest conservation or other competing land uses for more optimal, or at least better balanced, outcomes. • assess and refine/reform existing governance structures within the landscape in order to identify the optimal arrangement that encourages inclusive negotiation to maximize participation and manage for potential conflict. • be a long-term commitment to better managing social and environmental concerns within the landscape, typically beyond the 1–3 year project cycle. **Study documents:** evidence of engaging multiple stakeholders from across scales. Such processes should illustrate an effort to assess the needs and aspirations of stakeholders, and therefore be integral to identifying potential trade-offs and synergies. **NB:** Stakeholders can be defined "as people or organizations either affected by the management process or who can affect it" (Glicken, 2000; Hassenforder et al., 2016). **Study identifies** (and ideally implements): a set of metrics to evaluate progress and change within the landscape.

The final suite of studies for analysis comprised of 24 landscape approach examples from the peer-reviewed literature and 150 from the grey literature (see supplementary material). These "landscape approaches", however, were often labelled differently within the captured documents – for ease of understanding, if they conformed to the criteria they were included and are hereafter referred to as landscape approaches. The initial objectives for this review were to first, identify where within the tropics landscape approaches had been/were being implemented, and second, to determine the characteristics of the interventions. We did not seek to identify a measure of success as landscape approaches are long-term processes and the interventions would likely be ongoing, and landscape approaches are notoriously difficult to evaluate due to their complexity. However, during the screening of the peer-reviewed documents we increasingly encountered articles that were indeed reporting, or alluding to, successful outcomes. Consequently, we became interested in both the "effectiveness" of landscape approaches and also the quality of the reporting of landscape approaches – for example: how, and by whom, is success determined; what attributes of conservation and development are being influenced; and is there sufficient and verifiable data?

In order to further explore these interests, we developed some simple indicators that could represent positive characteristics of a landscape approach in practice. Our previous assessment of the literature (Reed et al., 2016) enabled us to identify a very broad set of guidelines, enabling/pre-conditions, and indicators that—from a theoretical perspective—should facilitate progress on the ground. For the purposes of this review and in the interest of manageability and capacity we condensed these to a few key criteria against which to evaluate the implementation and progress of landscape approaches in the tropics. We consider landscape approaches ought to (at a minimum) display evidence of some or all of the following:

- Good pan-tropical coverage (to establish that uptake of landscape approaches is occurring)
- System of governance (it is anticipated that a multi-scale governance system would be optimal but, at a minimum, some indication that some sort of structure of governance in place)
- Baseline assessment (not limited to biophysical data collection, this might include a negotiated theory of change, identified common concerns, evaluation of tenure/rights, household surveys, use of national inventory data etc.)
- Attempt to integrate conservation and development concerns at a landscape scale
- Regular stakeholder engagement (this might take the form of a multi-stakeholder platform or similar)
- Ongoing assessment (metrics and indicators for regular assessment of conservation and development impacts, mechanisms to account for dynamic processes, use of adaptive management)
- Impact (does the landscape approach report a measure of success/failure/lessons learned)
- Outcome data (robust and verifiable qualitative/quantitative data to support claims of success)

While we did not expect studies to consistently report on all of the criteria detailed above, we developed an Excel database to systematically capture any relevant information observed during the literature screening process. Where possible, within-cell drop-down options were provided to enhance consistency and enable comparative analysis. However, in part to acknowledge the diversity of landscapes, the database was "live" and reviewers were encouraged to develop additional variable columns, or provide further comments of interest beyond the scope of the outlined criteria, as and when required. This process resulted in a final datasheet with a large number of variables of potential interest (n = 76) but it was rarely the case that studies sufficiently reported on all or even the majority of these variables and there were numerous empty cells or missing data points which is a recurring issue for systematic reviews within the environmental sciences (J. Oldekop, personal communication). This high percentage of missing data limits our ability in some elements of our analysis (see Results section below).

Literature searches were conducted in September 2014 and captured 13,290 peer-reviewed articles of potential interest. Sequential screening at title, abstract, and full text filtered this number to 82 relevant articles from which we found 22 case studies for inclusion. A total of 488 grey literature documents were retrieved from the following sources: call for grey literature (57 documents); web screening (293 documents); author group and partners (56 documents); bibliographies of key articles (82 documents). From the 488 grey literature documents, 150 were accepted for inclusion. An updated literature search was conducted in November 2015 to capture any literature produced during the screening process. This search produced 3542 articles, from which a further two case studies were included, giving a final figure of 16,832 documents screened with 174 case studies (24 peer-reviewed) included in the final review.

3. Results

3.1. Geographic coverage of landscape approaches

We found evidence of landscape approaches being implemented across the tropics, with 51 of 169 tropical countries represented in the review (Fig. 1). However, reports of landscape approaches were far more prevalent in the grey literature (n = 150) than in the peer-reviewed literature (n = 24). Furthermore, both the fragmentary and simplified nature of the study details in the grey literature limited our ability to perform comparative analysis between the grey and peer-reviewed for each of our research questions – in such instances analysis was only performed on the peer-reviewed material. For example, information regarding the configuration of land uses within the landscape was largely absent from the grey literature (see supplementary material); reports were often limited to anticipated, pilot, or recently formulated projects; and in many existing projects outcomes were reported but often not supported with the necessary data. As such, it was often the case that our analysis of the data was restricted to just the peer-reviewed material.

3.2. Evidence of integrating conservation and development objectives

Due in large part to the focus of the study being on integrated projects, overall, there was consistency across both the peer-reviewed and grey literature in attempting to integrate conservation and development objectives. However, of note, we found, particularly from the peer-reviewed material, that it was often the case (peer reviewed: n = 14) that a project initially had a single sector focus and then evolved—often in response to challenges encountered—to incorporate other objectives and thus developed characteristics more closely aligned with a landscape approach (see suppplementary material). We found further consistency in the reporting—or more accurately lack thereof—of baseline assessements. Across the studies, evidence of any form of basline assessment was rarely reported and when there was, this typically consisted of "identifying a common concern" (n = 16) as opposed to evidence of any robust social or biophysical baseline data. There was insufficient data and reporting in the grey literatue to develop any further analysis here.

3.3. Effectiveness of landscape approaches

A large proportion of both grey literature (44%) and peer-reviewed (54%) documents described successful outcomes, that is claiming—typically within the conclusion of the report—that the landscape approach had been, or was proving to be, successful in the delivery of either, or both, societal or environmental enhancement. However, in the majority of cases the evidence of reliable monitoring and ongoing assessment of landscape approach effectiveness was lacking. We did not identify any unsuccessful examples. However, 8% reported "mixed" outcomes; these were typically interventions that had reported positive socio-economic effects (i.e. improved livelihoods) but negative environmental effects (i.e. increased deforestation) or vice versa.

3.4. Evidence of environmental or social change

"Success" was often unsupported with empirical data, relying instead on self-reporting of anecdotal evidence alone. The peer-reviewed material presented numerous issues when it came to the quality of reporting and the presentation of reliable data with only one quarter (n = 6) of the studies providing relatively comparable, reliable data (although only nine of the 150 grey literature

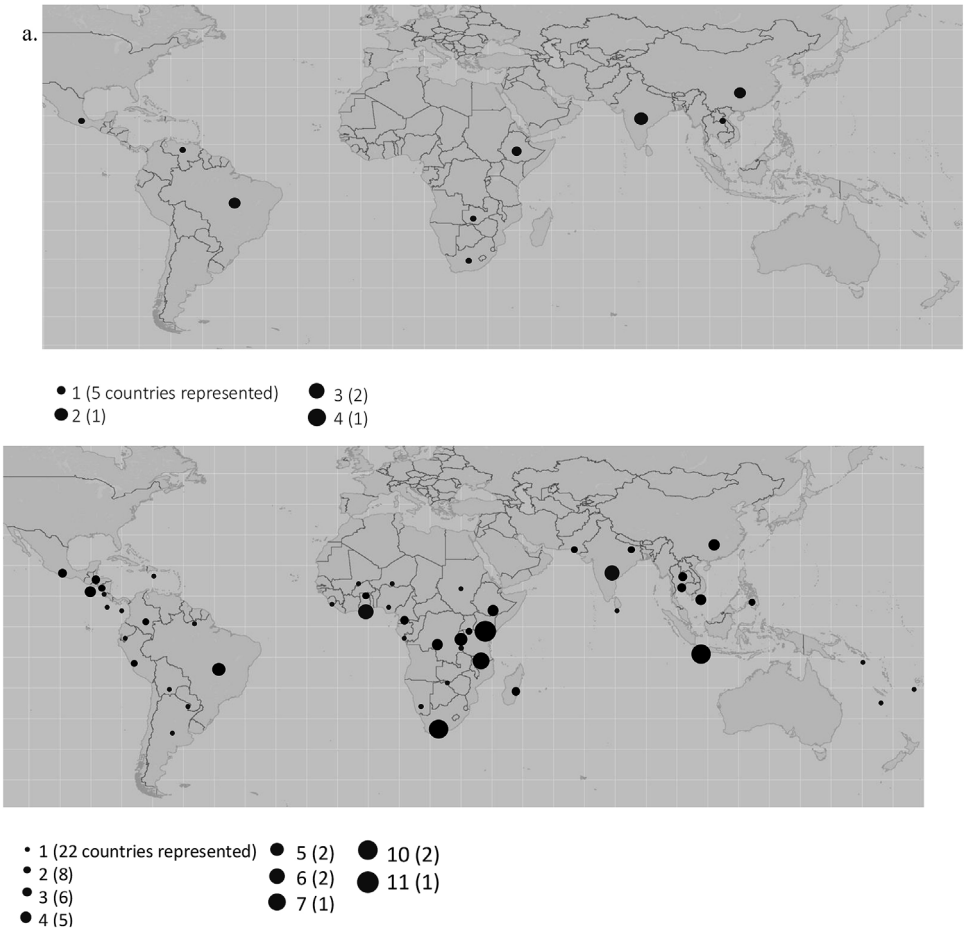

Fig. 1. Geographic distribution showing number of integrated landscape approaches in the tropics. a. peer-reviewed studies b. grey literature studies. The first number indicates the amount of ILAs the point represents, the number in brackets represents the number of countries that have the corresponding amount of ILAs. *Transboundary studies are not indicated (peer-reviewed = 8, grey literature = 14).

documents provided similar evidence). From the peer-reviewed literature we were able to determine which attributes of conservation and development had been reported as being positively influenced through these proportedly successful interventions. Despite this analysis only being possible for half of the 24 peer-reviewed studies, the findings indicate that landscape approaches offer potential to positively influence a range of socio-economic and environmental variables (Fig. 2). However, the small sample size—due to a lack of sufficient reporting—should be noted when interpreting the results presented in Fig. 2.

3.5. Factors contributing to intervention success

The results suggest that stakeholder engagement, sufficient institutional support, and effective structures of governance were considered necessary across most case studies that were reported as being successful (Fig. 3). However, details of how to effectively engage stakeholders or utilise institutional support were mostly lacking.

3.6. Evidence of governance structure in place

Where possible to determine (n = 126–peer-reviewed and grey literature combined) we found that a multi-level system of governance—a hybrid system that marries traditional top-down authoritarian structures with bottom-up democractic processes—was both most common (59%) and most highly correlated with reported success (Fig. 4). Despite rhetoric supporting bottom-up governance (see discussion below), we found few examples in practice (3%) and top-down structures remain prevalent throughout the tropics (38%). It is important to note here that studies rarely made explicit reference to the governance structure in place and reviewers often made an informed judgement call. The double screening that was performed helped to achieve consensus between at least two reviewers. If after consultation within the author group, some doubt as to the governance structure remained the study was classified as not determined.

4. Discussion

Recent papers present evidence suggesting that integrated landscape approaches that aim to enhance conservation and development are being embraced across the tropics (Estrada-Carmona et al., 2014; Milder et al., 2014). Meanwhile, conservation funding is increasingly targeted at integrating conservation with development (Miller, 2014) and there is burgeoning support for the implementation of landscape approaches from international conservation and development agencies, and within global policy discussion. Despite this, we were unable to identify a single landscape approach that adequately reported—that is with reliable, in depth collection and reporting of data—proven effective balancing of social and environmental trade-offs through multi-scale processes of negotiation for enhanced outcomes. Instead, we recorded a limited number of interventions from the peer-reviewed literature that displayed basic characteristics of the landscape approach—albeit often labeled differently—and a num-

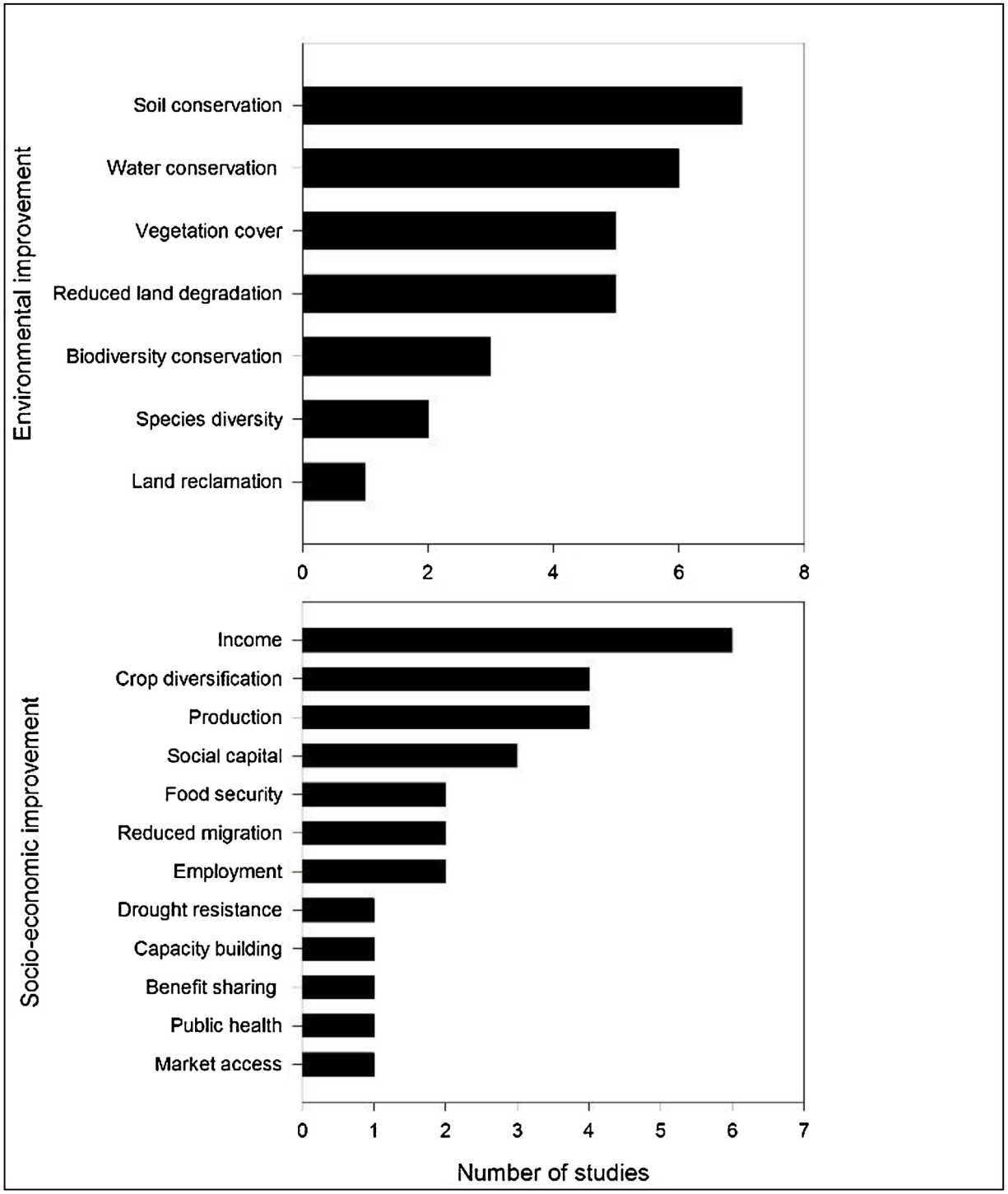

Fig. 2. Reported (a) environmental and (b) socio-economic improvements from peer-reviewed studies (n = 12). *Studies often reported on multiple outcomes and therefore the total number of data points is greater than the number of studies resented here.

ber of grey literature documents that were either in a formative stage or failed to provide a level of reporting necessary for analysis. First, we question why there is a clear lack of evidence of the effectiveness of the landscape approach in the literature. We then consider the significance of scale, structure, and objectives when attempting to integrate conservation and development, and finally we examine the challenges of collecting evidence of the benefits of implementing a landscape approach.

4.1. Lack of evidence of the effectiveness of landscape approaches?

Here we identify three key reasons why there is a lack of evidence about the effectiveness of landscape approaches. First, the fact that only 15% of the total number of case studies identified in this review came from the peer-reviewed literature could point to a lack of evidence of implementation. While we captured 150 grey literature documents, these largely comprised of landscape approaches that were still in a developmental stage.

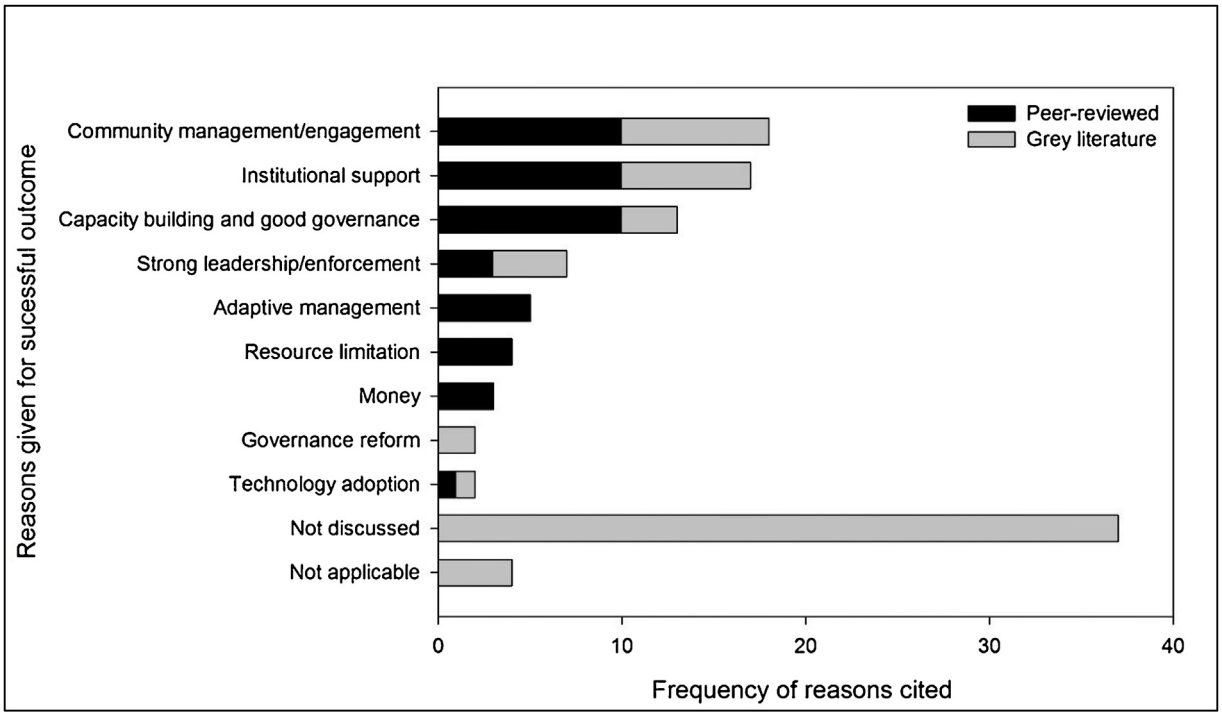

Fig. 3. Identified contributing factors towards successful outcomes of peer-reviewed (n = 13) and grey literature studies (n = 66).

We could speculate that landscape approaches—despite gaining support—are as yet, not being widely implemented in the tropics. It could be that integrated landscape approaches are still evolving as a concept and as such, implementing organisations—lacking the sufficient knowledge that enables capacity—retain a certain reluctance to commit. Other concepts and frameworks that attempt to integrate conservation and development have experienced similar "teething problems" (Pahl-Wostl, 2002; Medema et al., 2008), although, perhaps a key difference is that—as yet and to the best of our knowledge—there appears little theoretical resistance to the concept of a landscape approach as a viable implementing framework. Yet it is apparent that barriers to implementation persist (Reed et al., 2016) and strong support for land sparing approaches to conservation remain, which is reflected in this review in the low number of peer-reviewed landscape approach studies captured. The grey literature offers some cause for optimism in this regard however with many of these documents detailing pilot studies, proposals, or implementing agendas suggesting that commitments to implementation may be forthcoming.

The findings from the peer-reviewed literature led us to question further—is there a lack of empirical evidence of effectiveness or is the evidence simply not being effectively reported? The results would suggest that there is support for both of these statements. It has been reported previously that field project implementing agencies may lack either the capacity to report findings of sufficient scientific rigor (Sunderland et al., 2009) or the motivation to report failures in order to not jeopardize future funding opportunities (Knight, 2006; Pullin, 2015). This review found only a small percentage of case studies in the scientific literature that provided robust empirical data (25%)—despite often reporting successful project outcomes (54%). An even greater discrepancy was found in the grey literature, only 6% of which provided robust data while 44% claimed success. Furthermore, we did not find a single study that categorically demonstrated a landscape approach that had failed in its objectives. As a result, while examples of lessons learned do exist, they remain disappointingly few and far between (Browder, 2002; Laumonier et al., 2008; Nyame et al., 2012; Sunderland et al., 2012; Castella et al., 2014). Moreover, the lack of negative outcomes suggests a reporting bias (see: McGauran et al., 2010) that could be partly explained by both the tendency of scientific studies to favour reporting of positive findings and the continued trend of short-term, small-scale projects that rarely demand evidence of monitoring and evaluation of interventions (Pullin, 2015). The typical three year time horizon is sufficient for the production of a summary paper, methods paper, or recommendation for future research but it is perhaps insufficient for documenting and detailing any long-term change induced from the intervention. Conversely, long-term interventions across large landscapes that are difficult to assess will require greater human and financial investment to monitoring and evaluation (M&E) in order to identify outcomes that may not be immediately obvious or available and will likely change over time. In both scenarios, there is a significant disincentive to invest in inclusive monitoring and reporting of results.

This paucity of "scientifically supported" landscape approach case studies could further be attributed to the lack of a universal definition and guiding framework for implementation (Sayer et al., 2013). Although multiple authors have proposed definitions (e.g. Barrett and Peles, 1994; Sandker et al., 2010; Kutter and Westby, 2014; Reed et al., 2015), they have mostly failed to capture the balance of providing the necessary level of detail with sufficient brevity that will likely be required to garner universal support. Similarly, the scientific literature is replete with examples of guiding frameworks, implementing proposals and recommended future research agendas (Brandon and Wells, 1992; Naveh, 2001; Fischer et al., 2006; Frost et al., 2006; Keough and Blahna, 2006; Chazdon et al., 2009; McShane et al., 2011; Sayer et al., 2013; Milder et al., 2014; Freeman et al., 2015) which despite showing overlaps have failed to instill consensus within the research or practitioner communities. We have previously speculated that the clamour to define, refine, and re-brand seemingly replicate iterations of landscape approaches may ultimately be impeding efforts towards implementation and in fact disengaging policymakers (Redford et al., 2013; Scherr et al., 2013; Reed et al., 2016; Chazdon and Laestadius, 2016). While we accept the need to further develop guiding cri-

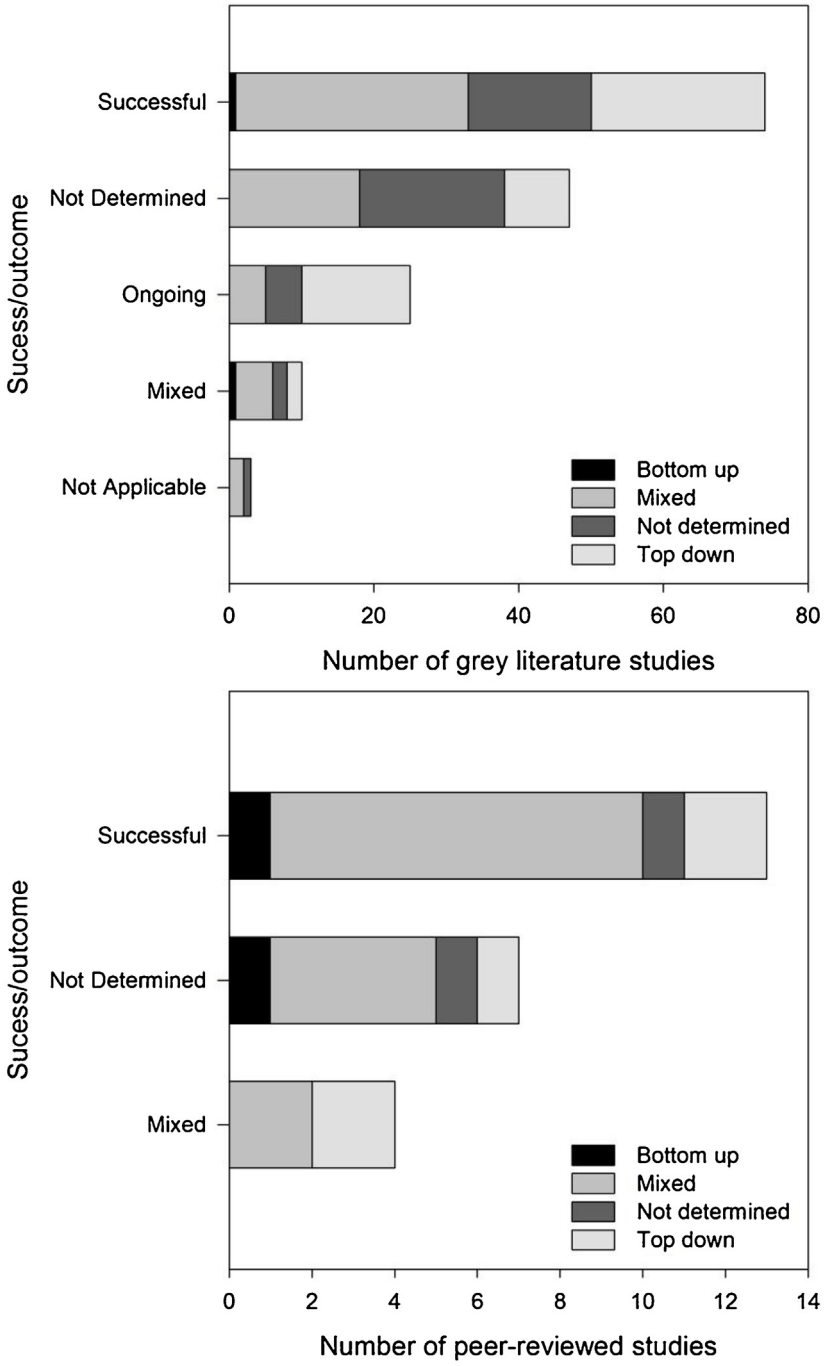

Fig. 4. reported successes of all landscape interventions (grey literature and peer-reviewed) and the proportion of governance structure types that the interventions used (n = 174).

teria for implementation, we encourage collaborative efforts that subsequently follow up with commitments to implement. Moreover, the fundamental importance of recognising context-specific nuances (Ward and Shackleton, 2016)—reduces the relevance of an unambiguous definition or universal framework as a degree of pluralism is always likely to exist and should perhaps even be encouraged.[1]

4.2. The significance of scale, structure, and objectives

Recognising a common concern when implementing a landscape approach links to both the contributing factors to success and project focus findings of this review. An agreed acknowledgement of a resource limitation (common concern) was identified as being a factor towards project success in 38% of peer-reviewed studies. Meanwhile, the project focus findings suggest that integrated approaches may still retain a limited spatial and sectoral focus. For example, from across the 24 peer-reviewed studies, there were 18 landscape features (see supplementary material) documented as being forested areas that were under some form of protection (PAs, NPs, reserves, or exclosures). This raises questions

[1] http://blog.cifor.org/23834/landscape-approach-defies-simple-definition-and-thats-good#.VPgbrzSUdKo.

of whether landscape approaches are restricted by administrative boundaries and whether we have learned from the lessons of previous efforts at integrating conservation and development, such as ICDPs for example that were criticized for being too localized in focus (Wells and McShane, 2004; McShane et al., 2011). It has been suggested that maintaining a narrow focus primarily on protected areas for forest/biodiversity conservation or buffer zone management inadequately accounts for local social development and therefore risks further marginalizing vulnerable groups (Adams et al., 2004; Lockwood et al., 2012). We acknowledge that the project focus findings could be conceived as a limitation in the search strategy. For example, had we included REDD/REDD+ in the search strings we would clearly have generated many more projects with an emissions reduction focus. However, when we designed the search stategy it was with the objective of capturing landscape approaches that were distinct from both prior integrated approaches to conservation and development and the REDD discourse, despite some evidence of their potential connectedness (Blom et al., 2010; McCall, 2016).

Implementing a landscape approach requires managing multiple layers of complexity and in all likelihood the ability to align local needs and capacities with regional, national, and global objectives and commitments (Browder, 2002; McShane et al., 2011; Chia and Sufo, 2015; Reed et al., 2015). Multi-level structures that foster cross-scale and cross-sectoral dialogue may be the most appropriate method for governance of multiple resources (Colfer and Pfund, 2011; Torfing, 2012; Ros-Tonen et al., 2014). It is encouraging that we found a significant proportion of studies reporting a multi-level governance structure. Further, multi-level governance appears to translate well to the delivery of positive conservation and development outcomes. Given the rhetoric in support of bottom-up approaches to landscape management (Ostrom et al., 1999; Pretty, 2003)—which is also supported in part by the factors for success identified in this review below—it is perhaps surprising that we found so few examples of community-based or bottom-up approaches. However, it could be speculated that where bottom-up approaches have been effective there may not be the capacity or motivation to monitor or report on them. Furthermore—although perhaps not so surprising given the ongoing trajectory of development and governance reform within the tropics—we found top-down governance structures maintain a high degree of prevalence. Some of the literature suggests that top-down governance can be effective for addressing sector-specific conservation goals (Ibrahim et al., 2010; Nepstad et al., 2014), and our analysis shows there to be a good relationship with 48% of studies adopting this system reporting successful outcomes. However, landscape approaches that adopt—or are embedded within—a top-down governance structure are counter to its basic premise that promotes open and transparent negotiation processes across all scales from the outset. If the implementing agency enters negotiations with a pre-conceived agenda and list of objectives, it needs to be questioned whether the intervention actually represents a landscape approach – i.e. an approach that attempts to balance trade-offs across multiple actors and scales and in particular recognizes the needs and aspirations of local stakeholders.

Ideally landscape approaches should have continual adjustment with short and mid-term objectives to assess progress (Sayer et al., 2013). Therefore the production of (regular) progress assessment reports that detail both successes and also failings would be useful to enhance understanding of what works and why. Our findings clearly suggest there is a requirement for further evidence of what works, but that there is perhaps a greater need for examples of lessons learned when projects might have failed in their objectives or produced unexpected outcomes (Knight, 2006; Sunderland et al., 2009; Clark et al., 2016). Only trial by experimentation will enable us to measure effectiveness and only by identifying failures will we be able to adapt. While it is important to evaluate the cost-benefit trade-offs when the approach is applied (in terms of balancing social and environmental objectives) we should also acknowledge the cost/benefit trade-off of actually applying the approach (in terms of success and failure). Knowledge will not only be informed by success and so the cost of applying the approach may actually be traded off against the benefit of the knowledge acquired from a "failed" attempt at implementation.

4.3. Collecting and reporting the evidence

In light of the difficulties surrounding monitoring of landscape approaches (Sunderland et al., 2012), the number of studies captured in this review that reported project successes was surprising. At conception the review objective was to merely report where and how landscape approaches were being implemented. A measure of success or project outcome was not considered a priority as we anticipated the projects we found would be largely ongoing processes—an acknowledgement of landscape approaches as long-term endeavors. However, we increasingly found projects reporting or alluding to measured outcomes—albeit often not supported by empirical data. While it is encouraging to show that landscape approaches have the capacity to positively influence societal and environmental attributes, the large proportion of successful outcomes demands some scrutiny. There is definite concern of publication and methodological bias here (Dickersin, 1990) – are journals, researchers and organisations more likely to publish positive findings? And if this is the case, should research be judged on its ability to achieve a set of pre-conceived criteria? While for small-scale studies over short time frames this may be an acceptable—although not preferable—model, if a landscape approach is to be accepted as a process and not a project (Reed et al., 2016) then a model that does not explicitly demand outcome results should be considered. While such a model may cause alarm for donors or investors in landscape approaches, we contend that an inclusive and regular process of defining objectives, measuring progress, and re-evaluating will better maintain commitment to the approach (see Sayer et al., 2016b). Longer term outcomes will inevitably change over time as different driver and actor constellations form and should necessarily be revisited and reconsidered.

Options to improve reporting of results have been identified and must continue to be developed to both enhance current understanding and inform future implementation efforts and policy recommendations (Shanley and López, 2009). There is certainly a need to produce sets of reliable metrics and indicators for assessing landscape approaches and there appears to remain an element of an inability to measure restricting the ability to report (Stiglitz et al., 2010). However, the growing body of literature on monitoring tools for integrated approaches (Bond and Mukherjee, 2002; Buck et al., 2006; Kusters et al., 2006; Aldrich and Sayer, 2007; Sayer et al., 2008; Belcher et al., 2013) ought to provide better means for meeting these requirements and tackling the issues going forward that this review has identified. A further challenge lies in building and maintaining local capacity to commit to long-term monitoring initiatives – particularly beyond the typical project time horizon. However, emerging evidence from REDD+ pilot projects suggests that when such commitment can be achieved, community collected data can contribute significantly to monitoring and reporting efforts (Bellfield et al., 2015). Finally, it may also be the case that insufficient investment in monitoring either historically or currently may have contributed to projects failing to reliably test effectiveness. Certainly if are we to use conservation as a guide, a recent survey supports this assertion with only five percent of projects performing robust monitoring and evaluation (Muir, 2010). Similarly, recent estimates of the financial investment in

monitoring have also been estimated as five percent of the total project spend.

From the peer-reviewed articles captured in this review, it was surprising that despite the fact that there are so few papers with examples of landscape approaches in the tropics, there is such inconsistency in reporting. We encountered numerous examples of studies not providing reliable social (qualitative) or biophysical (quantitative) data; not reliably detailing the landscape configuration; and not providing the necessary detail on type of governance structure or reform process (see also Kusters et al. in review). Perhaps this is due to the lack of previous studies and therefore an identifiable "gold standard" or prototype for reporting remains lacking but clearly the monitoring and reporting of such interventions demands greater attention. Again, acknowledging landscape context renders the development and application of a monitoring or reporting blueprint unlikely, and even unwelcome. However, if projects are not being sufficiently analyzed, reported and subjected to the peer-review process, it is difficult to draw conclusions or make meaningful policy recommendations – from the limited, robust, peer-reviewed evidence we have collected we can outline a normative set of recommendations but until these are tested in contextualized situations, we cannot be sure of their effectiveness (see also McCall, 2016).

5. Conclusion

This review of landscape approaches in the tropics suggests that this latest attempt to reconcile societal and environmental concerns has considerable potential as an implementing framework. While we have failed to provide a series of quintessential examples of the approach in practice, we have identified numerous examples of interventions that show positive characteristics of a landscape approach. Our findings suggest that contextualized landscape approaches can enhance multiple socio-economic and environmental outcomes. This synthesis also makes a significant contribution to future implementation efforts by tentatively identifying which factors are likely to influence social and environmental change. However, we have also identified a number of concerns. Foremost amongst these is that landscape approaches remain an attractive concept in theory but the current evidence base is lacking in the necessary precision to adequately assess the effectiveness in practice. There have been suggestions that the landscape approach might possibly represent the latest conservation/development "fad" (Redford et al., 2013). However, until the concept has been further tested and evaluated this is at best redundant and at worst, an impediment to making real progress towards integrating conservation and development.

Attempts to implement a landscape approach are inherently complex as they are often large-scale and encompass multiple stakeholders from across sectors and therefore are likely to involve marked asymmetries in power and influence. They are also very difficult to assess requiring both biophysical and social data collection and analysis, as well as the analysis of existing governance structure, and understanding the processes of governance reform and possible drivers of change. Landscape approaches are also risky as they are often expensive and yet may fail to deliver tangible social, economic, or environmental outcomes, especially over the short term. However, without innovative and long-term commitments to implement, test, and evaluate, there is a danger of being caught in a cycle of continually defining and re-fining the conceptualization of landscape approaches until interest is lost or the next iteration of integrated resource management and social development is conceived (cf. Redford et al., 2013). Such efforts at implementation should be cognizant of these challenges, have mechanisms embedded that acknowledge the potential for unsatisfactory outcomes, and apply the principles of adaptive management accordingly. While landscape approaches remain epistemologically contentious (Sayer et al., 2016a), researchers must be afforded the time to further develop their conceptualization, and yet all stakeholders must be encouraged to utilize the current body of knowledge to apply and evaluate the approach in practice. If we cannot translate knowledge into practice, how can we ever expect to translate science into policy?

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