



Integrated landscape approaches in the tropics: A brief stock-take

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ABSTRACT

Continued overexploitation of natural resources and the associated impacts of climate change threaten the sustainability and biodiversity of our global social-ecological systems. ‘Integrated landscape approaches’ are governance strategies that attempt to reconcile multiple and conflicting land-use claims to harmonize the needs of people and the environment and establish more sustainable and equitable multi-functional landscapes. Such approaches have gained prominence in recent conservation and development discourse, but critics have suggested a need for evidence of effectiveness to bridge knowledge-implementation gaps. Here we review the recent literature to provide a brief update on developments in the science and practice of landscape approaches, primarily in the tropics. We show that despite considerable enthusiasm for landscape approaches, the evidence base within the scientific literature remains poorly developed. Future application of landscape approaches requires concerted transdisciplinary actions that connect scales of governance to address the complex political economies in contested tropical landscapes. We highlight important challenges and opportunities for landscape approach implementation, particularly related to bridging sectorial and disciplinary divides, engaging the private sector, and monitoring landscape performance.

1. Introduction

In the globally interconnected world we now occupy, socio-economic progress has come at the expense of the over-exploitation of natural resources (Whitmee et al., 2015), large inequalities persist and there remains an institutional failure to plan long-term for the global common good (Rees, 2018). In this context, the tropics represent a unique geography of concern as globally aggregated statistics of human prosperity mask important regional dynamics. Much of the tropics has not yet achieved the same degree of development experienced within temperate regions and concentrations of extreme poverty and malnutrition persist (Curtis, 2018).

Meanwhile, the tropics have experienced unprecedented levels of environmental degradation, primarily through rapid land-use change associated with the clearing of forests for agriculture, resource extraction and speculation (Curtis et al., 2018; Song et al., 2018). Furthermore, the tropics host a disproportionately large share of global biodiversity and are widely believed to contain the areas that are most vulnerable to the impacts of climate change (Barlow et al., 2018). As

tropical economies develop and demographic and livelihood activities and consumption patterns evolve, it is entirely conceivable to imagine that social and ecological systems of the tropics will become more inextricably interlinked, and thus contested (Barlow et al., 2018).

Consequently, recent global policy discourse has acknowledged the need to devise more integrated solutions that attempt to satisfy the needs of humanity, while mitigating environmental harm. The recent Paris climate agreement, and Sustainable Development Goals (SDGs) from 2015 explicitly call for more holistic approaches that better integrate the needs of people and planet, while the major conservation organizations and development agencies have respectively extended their modus operandi to better reflect the needs of people in conservation or nature in development (Reed et al., 2016). More recently, the private sector has expressed interest at working with broader landscape actors in attempts to green supply chains, particularly through commitments to emissions reduction or zero deforestation initiatives (Lambin et al., 2018). Consequently, as an attempt to reconcile multiple and often competing claims on land and land use, ‘integrated landscape approaches’ have become a pervasive discourse in the

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current conservation and development lexicon (Sayer et al., 2013; Reed et al., 2016).

As part of our own attempt to operationalize an integrated landscape approach in several tropical contexts,¹ we were motivated to conduct this stock-taking exercise of recent advances and actions in landscape approach discourse and practice. The foundation for this exercise is rooted in previous reviews of landscape approach theory (Reed et al., 2016) and practice (Reed et al., 2017) as well as a special issue collection on landscape complexity and governance (Ros-Tonen et al., 2018). We re-visited data and information collected during the aforementioned endeavors and subsequently used snowballing methods for capturing additional recent literature of relevance via screening bibliographies of relevant articles; tracking key landscape approach articles and their respective citations; web screening of appropriate research and environmental sustainability organizations; and pooling of the author group's collective knowledge and resources on the topic, followed by a rapid appraisal of the retrieved documents.

Below, we provide a brief overview of the contemporary concept of integrated landscape approaches, including a summary of published guidelines and design principles, after which we draw on the recent literature and highlight four challenges that are to be overcome in their implementation. First are persistent science-practice-policy gaps in environmental governance; second, the challenges regarding the engagement of the private sector; third, the limited evidence of their implementation and effectiveness; and lastly the challenges related to monitoring and evaluation. The final section discusses the findings and the potential way forward.

1.1. Integrated landscape approaches

There has been—and will likely remain—no universally accepted definition for an integrated landscape approach (Sayer et al., 2013). This is in part due to different interpretations of the landscape concept, since a landscape is not only context-specific, but also seen 'in the eye of the beholder' (Meinig, 1979). Nevertheless, with the term first introduced in 1983 (Noss, 1983), integrated landscape approaches are not a new phenomenon and there is an increasing understanding of what the concept entails. We do not attempt here to provide an exhaustive history of the evolution of the concept of landscape approaches (for overviews see Tress et al., 2001; Scherr et al., 2013; Reed et al., 2015; Arts et al., 2017), but rather focus on recent developments in science and practice.

The more recent conceptualizations of landscape approaches—essentially a governance strategy that engages multiple stakeholders in attempts to reconcile societal and environmental objectives at the landscape scale to identify trade-offs and potential synergies for more sustainable and equitable land management—is largely borne out of the biodiversity conservation literature of the early 1980s (Noss, 1983). Subsequently, the greater focus on the need for integration of agendas across the landscape since the 1992 Rio Summit spawned a whole range of approaches using the "integrated" pre-cursor, ranging from (integrated) natural resource management, water resource management, and rural development, to conservation and development (Reed et al., 2016).

These much-feted integrated approaches represented an important shift away from prior conservation or development strategies that were either overly bio- or anthropocentric. The expectation was that through an acknowledgement of the interdependencies of human and natural systems, more integrated strategies could be designed that enhance local well-being while halting environmental degradation, thus delivering win-wins for society and environment; and later triple wins when climate and other 'co-benefits' came to be considered (Reed et al.,

2016). While such integrated approaches delivered some initial successes (Agrawal et al., 1997; Michael et al., 1999; Cao et al., 2009), these were few and far between. It could be argued that where win-wins were achieved, it was within contexts that had previously experienced trajectories of lose-lose and simple leverage points could be identified to address the balance (Reed et al., 2017). Arguably the greatest successes of this tranche of integrated approaches was in generating both optimism for win-wins within both the conservation and development sectors, coupled with significant financial support from the donor community.

Unfortunately, this optimism was relatively short-lived. A body of evidence quickly emerged illustrating that rather than the much desired win-wins, typically these efforts generated win-lose or even lose-lose outcomes (Kusters et al., 2006; Tallis et al., 2008). It soon became evident that inherent trade-offs existed within conservation objectives and across conservation and development agendas (Wells and McShane, 2004; Chhatre and Agrawal, 2009) that ought to be made explicit (Sunderland et al., 2008; McShane et al., 2011). Further criticism was aimed at these integrated approaches for maintaining a too narrow spatial or sectorial focus and inadequately considering broader landscape dynamics (Sunderland et al., 2012), with for example integrated watershed management and integrated rural development being overly focused on water and local development respectively (Pfund, 2010; Stucki and Smith, 2011).

The increasing recognition of a need for a broader focus and acceptance that win-wins are the exception rather than the norm, have inspired what might be called the next generation of integrated approaches in the last decade. Such approaches, in theory at least, sought to take a 'whole-landscape' approach to reconciling conservation and development (Defries and Rosenzweig, 2010) based on a premise that there will be both winners and losers and that such synergies and trade-offs must be identified, negotiated and accounted for (Sayer et al., 2013; Reed et al., 2015). It is these approaches that we are concerned with here and specifically to what extent they have been successful in delivering their objectives or identifying barriers to progress.

1.2. Principles and guidelines

Several attempts have been made to formulate guiding or design principles for integrated landscape approaches (Sayer et al., 2013; Denier et al., 2015; Freeman et al., 2015; Ros-Tonen et al., 2015; Bürgi et al., 2017; Djenontin et al., 2018). While it is difficult to establish true consensus of thought, there is convergence around several key themes (Table 1).

Firstly, it is crucial to establish just who are the relevant stakeholder groups within the landscape of interest. It is necessary to consider who undertakes this task, and to what extent they possess the capacity to identify and engage the various stakeholder groups. It is inevitable that some (possibly highly influential or marginalized) stakeholders will not be, or might not want to be, identified. The stakeholder groups will vary by landscape, but might include, for example, local policy, farmer groups, civil society, (inter)national research organizations, non-governmental organizations, national policy, private sector organizations, resource user groups, conservation groups, development organizations etc. Initial engagement of such diverse groups will require significant scoping and discussion, often using network analysis methods (Prell et al., 2009; Reed et al., 2009), in order to build trust and ensure legitimacy and transparency of process (Kusters et al., 2018).

Secondly, to incentivize engagement it is recommended that a common concern or shared entry point is identified at the outset (Sayer et al., 2013; Ros-Tonen et al., 2018) as a basis for co-developing strategies to address food security, forest loss, water scarcity or climate change adaptation. For example, if forest loss is accelerating, this might have implications for local communities who are reliant on wood for fuel; policymakers who have commitments related to emissions reduction targets; and private sector supply chains affected by the loss of

¹ <https://forestsnews.cifor.org/57339/getting-landscape-approaches-off-the-ground-on-the-ground?fnl=en>

Table 1

Key themes associated with integrated landscape approaches – this is not meant to be an exhaustive list nor a framework for implementation, rather a selection that have consistently featured in the literature.

Theme	Purpose	Relevant literature
Stakeholder identification Establish common concerns	Ensure relevance, legitimacy, and comprehensiveness of participation, build trust Collective action will be expedited if concerns and solutions are perceived to be shared by multiple stakeholders	Prell et al. (2009); Reed et al. (2009) Sayer et al. (2013); Ros-Tonen et al. (2018)
Multi-stakeholder forum in place	Provide space for negotiation of land-use trade-offs and synergies, encourage transdisciplinarity and co-learning, be attentive to power dynamics	Pfund et al., (2010); Freeman et al. (2015); Bürgi et al. (2017); Sarmiento-Barletti and Larson (2019)
Monitoring and evaluation systems	Measure progress towards relevant socio-economic, environmental and governance objectives	Kusters et al. (2018); Sayer et al. (2017)
Iterative and adaptive management	Exchange knowledge, consider progress, identify leverage points and adapt future planning accordingly	Holling (1978); Meadows (2009)

forest-based ecosystem services and the resource base more broadly. Oftentimes, it will be the case that a rapidly diminishing resource (i.e. water) will serve as an entry point and accelerate collective action and/or institutional change. Clearly, if concern for the loss or maintenance of a (or several) resource(s) is shared by a diversity of groups, including private companies, stimulating collective action should be more readily achieved (Ros-Tonen et al., 2018).

Thirdly, it is widely considered necessary to establish a multi-stakeholder dialogue platform or forum that enables somewhat regular engagement of representatives from the relevant stakeholder groups (Denier et al., 2015; Kusters et al., 2018). The configuration of such a platform requires considerable planning to account for issues related to representativeness and political, technical, epistemological, gender and class power differentials (Sarmiento-Barletti and Larson, 2019). Previous research on the effectiveness of multi-stakeholder platforms has highlighted the need to strengthen links between higher and lower level actors in order to prevent further entrenchment of pre-existing inequalities and injustices (Hermans et al., 2017). The use of independent facilitation, governance monitoring frameworks (Kusters et al., 2018), and tools for stimulating multi-stakeholder negotiation (for a collection see Brouwer et al., 2015) can support this process. Meanwhile, ensuring that multi-stakeholder processes formally influence decision-making forums is essential for continued relevancy and stakeholder (particularly political) engagement (Fraser et al., 2006).

Fourthly, the development of appropriate monitoring and evaluation frameworks are vital to monitor progress toward established process and outcome indicators (Sayer et al., 2017). Such frameworks will need to be contextualized, but the design of these should be based on fundamental principles that account for the needs of the relevant stakeholder groups and where possible aim to use core indicators that satisfy multiple demands.

Finally, the collection of good data only becomes valuable when it is then analyzed, interpreted and re-visited. Principles of adaptive management (Holling, 1978) are therefore fundamental to the ongoing maintenance of an integrated approach, whereby stakeholders use collected data to determine landscape trends and dynamics, identify where synergies and trade-offs might exist and then re-negotiate and adapt planning and management accordingly (Meadows, 2009). It is suggested that in emphasizing the need for co-responsibility of social-environmental governance, any ‘losers’ in the process can be identified and alternative interventions sought (Reed et al., 2016) such that in time there will be ‘more winners and less losers’ (Sayer et al., 2014).

What has become increasingly clear in recent decades is that when attempting to satisfy conservation and development agendas in isolation or in tandem, there are no panaceas (Ostrom et al., 2007) and while win-win outcomes remain desirable, and can be achieved (Oldekop et al., 2019), trade-offs that demand hard choices will ultimately be the norm (McShane et al., 2011). We should not expect the latest gamut of integrated approaches to fare too differently – they are, after all, an evolution of prior approaches. However, armed with this knowledge of the past, these more recent iterations—when applied

appropriately—hold potential to elevate our understanding of the contextualized conditions under which sustainable development can be pursued.

1.3. Environmental governance and the need to bridge science-practice-policy gaps

One of the challenges facing integrated landscape approaches is the persistent gap between theory and implementation (Jasonoff, 1996; Shanley and López, 2009; Toomey et al., 2015; Bürgi et al., 2017; Toomey et al., 2017). Recent approaches to environmental governance therefore often propose a transdisciplinary agenda – ‘moving beyond disciplinary divides within academia to engaging directly with the production and use of knowledge outside of the academy...with societal impact a central aim of the research at hand’ (Toomey et al., 2015). In the context of tropical landscapes this requires engaging a broad range of stakeholders representing multiple disciplines, sectors, and scales of organization to collaboratively design and practice more sustainable and equitable landscape management. However, challenges remain (Reed et al., 2019). For example, a recent special issue dedicated to the very issue of increasing collaboration between science and practice found that most submissions were conventional land-use change assessments, rather than examples of the inter- and transdisciplinary research that were sought (Opdam, 2018). There are likely multiple explanations for this.

The interplay between local institutions and research organizations or government agencies—despite being a pre-requisite to effective co-production—is often lacking as they respectively have neither a history of, nor enthusiasm for, such engagement (Jentoft and McCay, 1995). Relatedly, the ethos of a landscape approach may be more conceptually appealing to researchers than to those stakeholders that are more directly impacted by the consequences of crossing jurisdictional boundaries and negotiated land-use decisions and actions (Ros-Tonen et al., 2015, 2018). An approach that has the potential to safeguard forests, enhance local well-being, conserve biodiversity and mitigate against the impacts of climate change is an easy sell. However, building awareness of the need to identify (and accept and negotiate for) trade-offs is an altogether different and considerably more challenging proposition; it is not unreasonable to suspect that neither landscape inhabitants faced with near-term socio-economic pressures nor policy-makers faced with short-term political cycles will be enamored at the prospect of short-term losses. As EC President Jean-Claude Juncker expressed in reference to political decision-making, “we all know what to do, we just don’t know how to get re-elected after we’ve done it”.²

It has long been acknowledged that overcoming instances of institutional mismatch depends upon analyses of how power relations manifest across multiple scales and levels of governance (Gibson et al., 2000; Young, 2002; Brown, 2003; Cash et al., 2006). Such analyses of the “politics of scale” (Görg, 2007) can enhance understanding of how

² The Economist (2007), “The Quest for Prosperity”, March 15th.

social-ecological systems function and evolve. The scientific literature emphasizes the need to consider the application of, and adherence to, rules and norms and the interplay between multiple institutions, agencies and actors operating within a designated space (Adger, 2000; Young, 2002) and increasingly relationships between and amongst international, national and sub-national governance processes.

Understanding the complex political history of land tenure is particularly crucial (Riggs et al., 2016). Landscape approaches should take into account the rights and responsibilities of all stakeholders (Westerink et al., 2017; van Oosten et al., 2019) and include the institutional circumstances that involve a high complexity and heterogeneity of actors and their overlapping multiple tenure systems and property rights (Mansourian and Sgard, 2019). For example, analyses could consider the effect that clarifying or enhancing the tenure rights of local stakeholders has on natural resource management (Robinson et al., 2014; Lawry et al., 2017) or the extent to which local stakeholders are able to assert such rights in decision-making processes and resist the objectives of local elites or private interests (Agrawal et al., 1997; Ribot et al., 2010); and how such transformations might contribute towards national commitments to international sustainability targets. Despite the need for such analysis being well recognized, we find limited incorporation within the recent landscape approach literature (Ravikumar et al., 2018). Indeed, a newly published report on tenure in landscape approaches concludes that refinement of analytical frameworks and organization of in-depth case studies are urgently required (Buck et al., 2019). Some recent progress in this regard are the development of a tenure diagnostic tool (McLain et al., 2018) and a typology of power dynamics (Morrison et al., 2019) that can help to facilitate more robust future landscape governance analyses.

There are also challenges associated with the recognition and translation of local knowledge. For example, tacit and context-embedded local knowledge may not be recognized or trusted by holders of codified and expert knowledge in government and research organizations (Berkes, 2009; Pfeffer et al., 2013), may not be easily articulated (Reid et al., 2006), or may arise from a different worldview with alternative assumptions, norms and rules (Bonny and Berkes, 2008; Arts et al., 2017). The politics of knowledge (Escobar, 1998; Goldman and Goldman, 2003) that prioritizes expert over local knowledge and sustains mainstream thinking in social networks (Loconto et al., 2018) still tends to be ignored in the literature on integrated landscape approaches, despite evidence of the value of local knowledge on agricultural and environmental interventions (Toderi et al., 2017; Panequegalvez et al., 2018).

1.4. Engaging the private sector

Recent years have seen something of a clamor to 'engage' the private sector in the implementation of integrated landscape approaches, the motivating factors for which appear to be two-fold. Firstly, and significantly, there is a substantial shortfall between the current finance invested in the climate and sustainable development agendas and the perceived amount required to fulfill these agendas (Clark et al., 2018). The majority of funding for these initiatives is secured from public or philanthropic sources, and it is therefore suggested that by more closely engaging private sector actors, they will be motivated to contribute to meeting the financing shortfall. Secondly, while the private sector has traditionally been more associated with the problem, rather than the solution to environmental degradation, this perception may be slowly changing. An alternative viewpoint suggests that public-private(-producer) partnerships can facilitate the greening of supply chains, encourage more environmentally sensitive behavior and stimulate 'green growth' (Poulton and Macartney, 2012). Also, concerns about failure to secure supply in the near future and to meet recent commitments to remove deforestation from major agricultural commodity value chains may create a compelling 'business case' for increasing private sector engagement in landscape approaches (Scherr et al., 2017; Ingram et al.,

2018; Ros-Tonen et al., 2018).

Such prospects for green investment create an incentive for landscapes and jurisdictions to engage in sustainable landscape management and landscape certification (Boyd et al., 2018). Certainly there is good reason to be skeptical of this agenda and there have been accusations of greenwashing as well as trust being eroded in burgeoning partnerships by the ongoing environmentally destructive actions of private sector actors (Pirard et al., 2015). However, with a more informed public demanding enhanced product sourcing information, a more pressing need for companies to reduce supply chain emissions and enhance efficiency as well as recognition that international products are often dependent on preserving natural capital (and local livelihoods) in source landscapes, there is potential for increased and fruitful collaborations (Arts et al., 2017; Scherr et al., 2017).

Whatever the motivation for the research and public sector engaging the private sector, it is clear that we are likely to see more examples of public-private and public-private-producer partnerships (Thorpe and Maestre, 2015) – regardless of who is initiating these collaborations. Certainly, there is an increasing number of companies—Mars, Unilever, Olam, Heineken, The Coca-Cola Company to name a few—who are (at least claiming to be) adopting a landscape approach to their operations. Furthermore, evidence from the scientific literature shows an increasing trend in private sector involvement in landscape partnerships (Kissinger et al., 2013; Denier et al., 2015; IDH, 2017; Scherr et al., 2017; Ros-Tonen et al., 2018).

Despite the illusion that such initiatives might be environmentally or even ethically motivated, it is hard to see beyond the motivation to secure and enhance the organization's economic bottom line. A company's willingness to pursue an integrated approach is typically driven by an aim to reduce operational risk related to future resource scarcity, reduce reputational risk related to consumer demand or compliance with recognized standards, and seek out opportunities beyond the area of production (Kissinger et al., 2013; Arts et al., 2017). Furthermore, some of the objectives of companies engaged in trading international commodities are typically mismatched with recognized principles for landscape approaches. For instance, agribusinesses have a sectorial focus, rely on annual production systems and produce quarterly reports to satisfy shareholders primarily motivated by economic profit; contradictory to landscape approaches that demand multiple stakeholders to engage across sectors in negotiation processes over longer timeframes in order to enhance equity and sustainability (Hart et al., 2015).

Finally, an emerging concern is the phenomenon of telecoupled landscapes (Carrasco et al., 2017). It has long been acknowledged that conservation (or development) interventions can stimulate unintended 'leakage' effects beyond the system of interest – typically in proximate localities. However, in the context of an increasingly globalized world, activities in one landscape can trigger spillover effects (both negative and positive) in distal landscapes (Barlow et al., 2018), perhaps connecting tropical and temperate regions (Reed et al., 2015) and even distant tropical regions (Meyfroidt et al., 2010; Sun et al., 2017). How to account for, and govern, such spillover effects is an emerging area of research (Hull and Liu, 2018; Liu et al., 2018) and is an important consideration for those engaged in landscape approaches, particularly when incorporating transnational companies.

Nevertheless, private sector engagement is often considered crucial to realizing the objectives of the climate and sustainable development agendas, as well as the Bonn Challenge and the related New York Declaration on Forests (NYDF) that respectively aim to restore 350 million hectares of degraded land and eliminate deforestation by 2030. Integrated landscape approaches have been recognized as a potential pathway to realizing these ambitions and the NYDF, in particular, was significant in that it attracted almost 200 private sector endorsements. Indeed, the latest progress report shows that while endorsements are slowing, corporate commitments have now reached almost 800 (NYDF assessment partners, 2018) and many companies have voluntarily set even more ambitious targets than those proposed by the NYDF. Less

encouragingly, commitments from the soy and beef sectors are still lagging behind, as are reliable data (across all sectors) to show evidence of progress toward deforestation commitments (Forestdeclaration.org, 2018). Indeed, the latest progress report shows that public and private sector commitments are failing to halt the destruction of natural ecosystems.³ However, such commitments, although voluntary and non-binding, if translated to action, can indeed stimulate the kind of transformations in business practices that the fulfillment of the SDGs and NYDF requires. However, greater support from financial institutions, governments and civil society organizations will be necessary.

Engaging the private sector in environmental governance discourse and practice is neither straightforward nor without challenges. While there should be an onus of responsibility on companies to more fully engage and cooperate, such actions should not be considered a panacea or alternative pathway to sustainable development – it is simply one potential component of many potential solutions. Moreover, as private sector initiatives and public-private(-producer) partnerships continue to evolve, the role of government regulation of business activities and the work of watchdogs in monitoring supply chain activities will have to play a crucial role. Examples include Trase Earth (<https://trase.earth/?lang=en>) and the Borneo Atlas (<https://www.cifor.org/map/atlas/>) while Forest Trends supply change (<https://www.forest-trends.org/who-we-are/initiatives/supply-change/>) tracks corporate progress toward voluntary commitments. The application of landscape approaches can also help by facilitating dialogue between private sector actors, politicians, and local community members in order to develop more long-term institutional planning and build trust, empathy and capacity to better negotiate landscape-scale decision-making processes (Langston et al., 2019).

1.5. Evidence of implementation and first assessments of effectiveness

Consistent with other disciplines related to sustainability, climate or natural resource management, landscape approach research has seen a marked increase in publications and scholarship in recent decades. A recent global review shows that there are plenty of landscape approaches being implemented worldwide. Members of the ‘Landscapes for People, Food and Nature’ (LPFN) group identified 87 cases of what they label ‘integrated landscape initiatives’ in Africa (Milder et al., 2014), 104 in Latin America and the Caribbean (LAC) (Estrada-Carmona et al., 2014), 166 in South and Southeast Asia (Zanzanaini et al., 2017) and 71 in Europe (García-Martín et al., 2016). Based on a systematic key word search and a comprehensive survey among landscape practitioners and managers, these studies provided the first global assessment of the characteristics, outcomes and limitations of landscape approaches, capturing 428 examples in total.

Despite some regional variations with regard to motivations, outcomes, and challenges, there were recognizable patterns consistent across the four continents, and in particular, significant overlap in the findings from Africa and LAC (Hart et al., 2015). For example, four landscape ‘domains’ were identified that remained consistent across continents: nature conservation, farming and agriculture, livelihoods and human well-being, and institutional planning and coordination. In addition, Africa included dimensions of conflict reduction and climate change, while Europe included a cultural heritage dimension. Of these dimensions, nature (resource) conservation was consistently identified as the primary entry point for pursuing an integrated landscape initiative, with governance typically dominated by agriculture and conservation sector stakeholders, and the most significant outcomes related to institutional planning and coordination. Identified challenges included poor engagement of the private sector, concerns over the long-term sustainability of the initiatives related to a lack of funding and

longtime horizons to determine effectiveness, and (with the exception of Africa) unsupportive or weak policy frameworks – all of which combined meant that progress and sustainability was often dependent on the impulses of civil society organizations. Nevertheless, there was a widely shared belief that implementation of integrated landscape initiatives could stimulate more holistic management that is consistent with the demands of multifunctional landscapes – particularly if enhanced political and societal support could be established. Perhaps unfortunately, no comparative analysis of the four continental reviews has yet been made available.

Another recent review charted the theoretical development of integrated landscape approaches (Reed et al., 2015, 2016). Insights revealed five key considerations for landscape practitioners and managers: evaluate progress, establish good governance, evolve from panacea solutions, engage multiple stakeholders, embrace dynamic processes. Somewhat reassuringly, these considerations were supported by the findings of a subsequent review of landscape approach implementation in the tropics that consistently showed that community engagement, institutional support, good governance and capacity development were fundamental contributory factors toward the success of landscape approaches (Reed et al., 2017).

Of the 174 captured examples (150 from the ‘grey’ / non-peer-reviewed literature) that showed characteristics of a landscape approach, there was not a single unsuccessful example. However, this review offered a cautionary tale with regard to the use of the term ‘success’ in relation to landscape approaches. While on the surface this appears encouraging, it might say more about the motivation to (not) report ‘negative’ findings. Furthermore, only 25 % of the 24 peer-reviewed cases provided robust data to support claims of success, while within the more abundant grey literature (n = 150), this figure fell to only 6 %. As the authors suggest, moving away from the dichotomous language of success and failure, and rather adopting a systems approach that prioritizes process and adaptation to determine enabling conditions and lessons learned, will likely be more constructive to the long-term sustainability of landscape approaches.

Another recent review process developed a typology of integrated landscape initiatives in Latin America and subsequently evaluated their performance (Carmenta et al., 2020). Using data from 104 different examples they found that landscape initiatives varied in their application along a spectrum of high to low integration. The analysis found that integration underscores performance, with those more highly integrated perceived to be more effective by project proponents.

Beyond the abovementioned reviews, we found very few independent case studies in the literature that evaluated landscape approaches, with articles more typically reporting on: scenario analyses (Willemen et al., 2019); stakeholder perceptions (Langston et al., 2019; Sulistyawan et al., 2019); land-use change assessment (Oliveira et al., 2020); design principles and methodological frameworks (Sunderland et al., 2017; Tello and González de Molina, 2017). We speculate that the dearth of reported case studies in the scientific literature is a consequence of landscape approach application being still in its relative infancy (Di Lucia et al., 2018).

The notion of evaluating landscape approaches has long been considered problematic for at least two reasons. Firstly, stakeholders will have varying perceptions of what is deemed a successful outcome. Illustrative are two recent publications on the impacts of landscape approaches in the Sangha tri-national landscape that arrive at divergent outcomes. Clay (2016) recognizes a significant weakness in landscape approach application as the inability to adequately consider the needs of local inhabitants who are neither part of the conservation or extractive industries. Meanwhile Sayer et al. (2016) suggest that one contribution in the region has been raising awareness of local people’s interests. Of course, as with landscape approaches themselves, there will be multiple reasons for these contrasting outcomes. One of these, temporality, is alluded to in both publications. Sayer et al. (2016) acknowledge that the challenges facing the Sangha Region have changed

³ <https://sdg.iisd.org/commentary/guest-articles/turning-the-new-york-declaration-on-forests-to-new-york-action-on-forests/>

markedly in the last decade and will likely continue to do so, while Clay (2016) emphasizes the need for a nuanced understanding of social-ecological relationships by considering both historical legacies and future trajectories of change.

Secondly, there is no common understanding of what should be considered as satisfactory evidence for success. Scholars acknowledge the fact that it is hard to really know whether landscape approaches are successful because robust evidence is missing and evaluation methods are not explicit (Sayer et al., 2016; Reed et al., 2017). Although counterfactual impact assessments have been common practice in other sectors (Banerjee and Duflo, 2009) and an encouraging body of evidence is developing for conservation and development initiatives (Agol et al., 2014; Ferraro and Hanauer, 2014; Baylis et al., 2016), they generally target simple, time-bound and relatively small-scale interventions. Applying them to landscape approaches is problematic because these methods generally require large sample sizes to find statistically sound controls (Sills et al., 2015). Besides, the complexity of landscape approaches, which generally correspond to an aggregation of smaller projects, and the fact that they are long-term evolving activities, are additional challenges to run such methods. Alternative approaches to determine “success” are needed, that take into account complex and long-term processes.

These inherent difficulties to apply robust evaluation methods are combined with the lack of reliable monitoring and evaluation systems. In landscape-scale research, monitoring and evaluation (M&E) has been described as the least well developed area (Lebel and Daniel, 2009), and often inadequately considered (Milder et al., 2012; Foli et al., 2018). There is certainly no recognized universal standard for monitoring or evaluating performance of landscape approaches. That is not to say that monitoring frameworks or indicator development has not taken place. They have, as will be seen in the next section; the problem seems to be associated with post-development lack of implementation, or certainly a lack of widespread adoption. We can speculate why this might be the case. It could be that once resources have been dedicated to the development of a robust M&E framework, there are insufficient financial resources to then apply this on the ground and hence a knowledge-implementation gap is created (lack of implementation). It could be that implementing actors are reluctant or lack the capacity to apply the frameworks developed by others (lack of adoption). Finally, the lack of a universally agreed upon M&E strategy might not necessarily be a bad thing; if we are to accept that we need to look beyond panaceas to address complex challenges (Ostrom et al., 2007) it fits that M&E strategies should be highly contextualized (lack of adoption). Nonetheless, robust (and ideally participatory) monitoring systems are a fundamental principle of landscape approaches and crucial to identifying trade-offs and synergies and informing processes of adaptive management. The next section reviews recent developments in this regard.

1.6. Methodological developments in monitoring and evaluation

To help overcome uncertainty in effectiveness and capture the breadth of landscape approaches, we need to move beyond a project mentality that focuses on outcomes and develop evaluation approaches that recognize landscape approaches as long-term endeavors that demand increased attention to complex processes.

Recent literature discussing the evaluation of landscape approaches has focused on the development of appropriate metrics and indicators. Resonating the broader movement of participatory evaluation (Dietz et al., 2013; Pouw et al., 2017), significant emphasis has been put on reconciling local needs with broader environmental objectives by incorporating local stakeholders in the development of landscape performance metrics. For example, the landscape measures framework (Buck et al., 2006; Milder et al., 2012) adopts a hierarchical approach of four overarching goals—conservation, production, livelihoods, and institutions with twenty sub-criteria—essentially 20 questions that serve

as indicators to evaluate social and biophysical change. Although the questions themselves are somewhat vague, reflecting the scale and diversity of landscapes, users are encouraged to refine, adapt or elaborate the questionnaire as required to best suit the landscape context and challenges.

Another framework that offers potential in its ability to capture both the dynamism of landscapes and the contrasting perceptions of multiple stakeholders is the capital assets framework used by Sayer et al. (2007). Similar to the landscape measures framework above, this approach advocates the use of social learning in a participatory process of developing simple indicator sets in key asset categories of financial, social, physical, human, and natural capital. In an explicit attempt to sustain stakeholder engagement—and presumably alleviate high transaction costs—the capital assets framework encourages continued and open stakeholder dialogue (as opposed to an over-reliance on expert opinion) throughout the process of conceptualizing, monitoring, and analyzing indicator sets. Analysis of the performance of “individual” assets relative to other assets allows for identification of trade-offs and can stimulate further stakeholder negotiation. Largely similar approaches are applied when assessing resilience or ecosystem service provision within a landscape (see for example Resilience Alliance, 2010; Potschin and Haines-Young, 2016).

We argue that considering other evaluation approaches and principles can help strengthen the identification of metrics and indicators to be monitored. One of them is systems thinking, which has been proposed as one of the core principles to evaluate complexity in the evaluation literature (Patton, 2011). Comprehensive landscape monitoring will likely depend on aggregate systems that encompass multiple variables of interest – ideally with one indicator being able to satisfy multiple objectives. While aggregate systems offer potential (albeit not without their own challenges), a rigorous assessment of a landscape system is contingent on an evaluation of not just the individual components, but also how these components interact to influence the whole (Levin, 1992; Ostrom, 2009). Besides, the absence of clear theories of changes for landscape approaches can hinder the evaluation of processes. Theory-based evaluation methods (Sayer et al., 2016) have been widely used to evaluate diverse types of interventions, but have rarely been used for landscape initiatives, except by IDH (<https://www.idhsustainabletrade.com/impact-research/>). Causal chains offer promising approaches to make assumptions of how actions affect various outcomes and can serve as the basis to design a monitoring and evaluation system (Qiu et al., 2017).

One added value of impact assessment is to move the evaluation question beyond the choice of appropriate monitoring metrics and indicators, and measure causal effects of interventions. For this reason, more widespread use of impact assessment is increasingly regarded as critical for determining dynamics across policy and practice (Mckinnon et al., 2015) and developing a ‘proof of concept’ (Mascia et al., 2014) based on a stronger, empirical evidence base enabling more effective design of future initiatives (Fisher et al., 2013) and support for future investment and buy-in (Mascia et al., 2014; Clark et al., 2018). We have seen that standard – experimental and quasi-experimental in particular – impact assessment methods are hardly applicable to landscape approaches, due to their large size, uniqueness, long time horizons and complexity. At best, such quantitative methods can be used to evaluate some components of landscapes. In this context, the use of mixed (i.e. quantitative and qualitative) methods for causal inference and qualitative approaches that provide tools for causal explanation (Maxwell, 2004; Beach and Pedersen, 2013) offer promise for evaluating landscape approaches.

While there are several potential frameworks and approaches for landscape monitoring and evaluation available, the specific context will largely determine what needs to be measured and evaluated and how. An important limiting factor to the development of appropriate metrics and methods for causal inference is the lack of data. Practitioners of landscape approaches should be encouraged to investigate the existing

publicly available data sources for their landscape of interest. Technological advances have greatly enhanced the ability to monitor land-use cover and change, and recent research also shows the potential for incorporating census, income, health and nutrition data, mobile phone usage and gas stove conversion figures to interpret the social implications of environmental decision-making (Jagger and Rana, 2017).

Advances include new data sources at increasingly fine spatial and temporal resolutions, improved algorithms that increase the accuracy of remotely sensed detection (e.g. of fire or rainfall) (Aragao et al., 2008) and the large open access platforms that make available prepared data that can be incorporated in to new analyses, e.g. Borneo Atlas, Trase, and Global Forest Watch (<https://www.globalforestwatch.org/>). Added to the burgeoning suite of processed remote sensed data and their repositories (e.g. Maryland's Global Forest Change, NASAs Wed Fire Mapper) are additional sources of geo-referenced data across the social, ecological (from biodiversity and carbon, to agricultural yields and soil quality) and economic domains. Examples are YieldGapMap (<http://www.yieldgap.org/>) and the World Conservation Monitoring Centre (<https://www.unep-wcmc.org/>).

Increased usage of publicly available spatial and social data sources can alleviate high transaction costs, but an element of 'ground-truthing' and data triangulation through random samples of household data, focus group discussions and semi-structured interviews with key individuals should be incorporated to provide a more complete analysis of landscape dynamics and intervention performance.

2. Discussion

Humanity has made unprecedented social and economic progress in the last century. However, the continued overexploitation of natural resources and the associated impacts of climate change threaten the sustainability of many tropical social-ecological systems. Evidence shows that where sectorial approaches to conservation or development challenges prevail, tensions between conflicting stakeholder objectives persist (Sandker et al., 2009; Carmenta and Vira, 2018). There is both a need, and desire, for more holistic approaches to addressing the challenges faced by tropical landscapes. Integrated landscape approaches are among such initiatives. This brief update on the progress of landscape approaches in the tropics reveals that there is considerable enthusiasm for landscape-scale interventions that clearly transcend the research and academic community.

The Global Landscapes Forum (GLF; <https://www.globallandscapesforum.org/>) as a "knowledge-led platform" has been successful in providing a convening space for actors that might ordinarily be at odds with one and other, and has a mandate to broaden its reach to engage over one billion people in integrated landscape approaches. In a similar vein, the Landscapes for People, Food and Nature Initiative (LPFN; <https://peoplefoodandnature.org/>) is a global network of more than 60 organizations that promote integrated landscape management to holistically enhance agricultural production, conserve ecosystems and sustain rural livelihoods. The donor community is also supporting such landscape initiatives with significant financial investment from, for example, the World Bank and the Global Environment Facility (forthcoming). While funding for landscape approaches is increasing (Miller, 2014; Sayer et al., 2017), it is largely secured from public or philanthropic sources and there remains a shortfall between what is available and what is required for long-term sustainability (Clark et al., 2018). Increasing engagement of the private sector could help to fill this gap. Indeed, integrated approaches that aim to link conservation and development concerns are gaining prominence in the business strategies of some of the world's largest commodity traders, while blended finance mechanisms that strategically combine development and philanthropic funds to mobilize private sector investment offer further potential – although a recent review suggests that while investments have accelerated in the last decade, these efforts have been

geographically and sectorially fragmented (Business and Sustainable Development Commission and Convergence, 2017). Nevertheless, landscape approach uptake seems set to accelerate having been adopted by many environmental research organizations (e.g. Rainforest Alliance, Global Canopy Programme, Center for International Forestry Research) and the big international non-governmental organizations (WWF, Conservation International, The Nature Conservancy and The Wildlife Conservation Society); and have recently been subsumed in international conventions related to climate (UNFCCC), biodiversity (CBD), forest restoration (Bonn Challenge) and development (SDGs). Clearly, an integrated landscape approach that better considers the needs of multiple stakeholders operating both within, or external to, the landscape of concern offers potential to develop more equitable management solutions. It is, however, important to recognize that such landscape approaches are not a cure-all remedy to all social and environmental ills (Ostrom et al., 2007; Robinson et al., 2017) and that important gaps in understanding will inevitably remain.

Challenges for the implementation of landscape approaches include accurately conceptualizing what they represent and how they should optimally function – both in terms of the appropriate spatial scale for implementation and the configuration and governance of actors (Clay, 2016) and resources (McCall, 2016). The constructive ambiguity of landscape approaches as a concept has arguably accelerated their acceptance as a feasible solution to landscape-scale challenges while simultaneously, and paradoxically, hindering their application. It is worth considering the extent to which landscape approaches, in common with other integrated approaches before, are more marketable than implementable (Pfund, 2010). Certainly, the scientific literature points to a lack of *evidence* of effectiveness (Reed et al., 2017; Sayer et al., 2017). This does not necessarily indicate that landscape approaches are not happening or that they are ineffective—it may be the case that more localized initiatives (Foli et al., 2018; Ros-Tonen et al., 2018) are not being adequately tested or reported. However, this lack of evidence does limit the ability to show where, and under what conditions, landscape approaches are successful (or even feasible). In particular this leaves us with an incomplete understanding of the governance and functioning of such initiatives in practice.

3. Conclusion

This overview has highlighted some of the challenges related to implementing and evaluating landscape approaches, some of which can be explained by the fact that the principles of landscape approaches are maladapted to the systems within which scientific research operates. In order to better engage with the realities of complex tropical landscapes, landscape approaches must be long-term and transdisciplinary in nature (Boedhihartono et al., 2018). However, funding for such long-term endeavors is a challenge with donors traditionally opting to support project cycles of 2–3 years and there remain significant challenges associated with bringing together actors from within and across areas of expertise and knowledge (Sayer et al., 2014). Question marks also remain over how best to 'engage' the private sector and 'incentivize' the political sector. Indeed, there are several elements of landscape approach theory that are, as yet, inadequately supported with robust empirical evidence. A more explicit analysis of the political economy (and ecology) of tropical landscape dynamics can provide a more nuanced understanding of normative concepts such as 'integration', 'adaptive management', 'honest brokerage', and 'muddling through'.

Landscape approaches are conceptually attractive (Chia and Sufo, 2015) and offer considerable potential to address socio-economic and environmental trade-offs facing people and nature in complex tropical landscapes. In contributing to meeting these challenges, landscape approaches need to be implemented in varied contexts, up-scaled, monitored, evaluated and documented. The research community has a fundamental role in the ongoing advancement of landscape approaches—both in theory and practice. Transdisciplinary research

approaches that learn from multiple and varied knowledge systems should be encouraged and can be supported by the application of tools for scenario-building and theory of change development alongside mixed-method analyses that capture social perceptions and ecological dynamics. Moreover, the future landscape approach research agenda must more explicitly address power asymmetries (Clay, 2016; Ros-Tonen et al., 2018) and recognize the heterogeneity of stakeholder and resource user groups to stimulate decision-making that is both more integrative and more inclusive of women, youth and other marginalized groups (Hart et al., 2015; Ros-Tonen et al., 2015, 2018). The research community can play a role in facilitating these processes by more fully engaging practitioners, political partners, the private sector and local communities to build the evidence base and ensure that integration goes beyond engagement; muddling through does not imply muddled thinking; and honest brokerage extends to honest reporting.

Author statement

JR, TS and AI conceived the study.

JR wrote the manuscript with input from all authors.

Declaration of Competing Interest

The authors declare no conflict of interest.

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