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# Structuring the Complexity of Integrated Landscape Approaches into Selectable, Scalable, and Measurable Attributes

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## Abstract

Integrated landscape approaches (ILA) aim to reconcile multiple, often competing, interests across agriculture, nature conservation, and other land uses. Recognized ILA design principles provide guidance for their implementation, yet application remains challenging, and a strong performance evidence-base is yet to be formed. A comprehensive literature review and focus group discussions with practitioners identified considerable diversity of ILA in actors, temporal, and spatial scales, inter alia. This diversity hampers learning from and steering these integrated planning approaches because of its intractable nature. Therefore, we developed a tool—an 'ILA mixing board'—to structure the complexity of ILA into selectable and scalable attributes in a replicable way to allow planning, diagnostics, and comparative assessment of ILA. The ILA mixing board tool presents seven qualifiers, each representing a key attribute of ILA design and performance such as project flexibility, inclusiveness of the dialogue, and the centrality of the power distribution. Each qualifier has five (non-normative) outcome indicators that can be registered as present or absent. This process in turn guides planners, evaluators and other participating stakeholders involved in landscape management to diagnose the ILA type, and or its performance. We apply the ILA mixing board as a diagnostic tool to three ILA cases in Nicaragua,

Madagascar, and the Congo Basin to show some of the many possible configurations of qualifiers on the mixing board. Overall, the tool allows comparative analyses of the complexity of ILA in a structured and manageable way.

**Keywords:** Land system science; governance; natural resource management; resource conflict; conservation; development; stakeholder engagement; ecosystem management; wicked problems

# Introduction

Humanity is facing combined and unprecedented challenges related to climate change, environmental degradation, and biodiversity loss, while food insecurity and poverty continue to be the daily reality of millions of people (Díaz et al. 2019; Hoegh-Guldberg et al. 2019). These global challenges fuel intensifying conflicts over land use creating trade-offs on ecological, economic, and social outcomes across scales, and across different groups of people (Meyfroidt et al. 2022). The resulting governance challenges, often referred to as 'wicked problems', are highly complex, often interconnected and further compounded by the diversity of temporal and spatial scales of processes, feedback loops, and stakeholders they involve (Rittel and Webber 1973; Balint et al. 2011; Defries and Nagendra 2017).

At the landscape level, integrated landscape approaches (ILA) seek to address such wicked problems (Scherr and McNeely 2008; Reed et al. 2014). ILA go beyond sectoral approaches by engaging multiple stakeholders, integrating policy with practice, and addressing social, environmental, economic, and political drivers (Foli et al. 2018). ILA revolve around the concept of landscape multifunctionality and aim to tackle numerous challenges by balancing multiple (and sometimes contradictory) interests, they ideally build on synergies, and identify and consider trade-offs (Pfund 2010; McShane et al. 2011; Milder et al. 2014; Ros-Tonen et al. 2014; Chia and Sufo 2016). Through this multi-sectoral, multi-actor approach and the recognition of multiple interests ILA are championed as a holistic approach, equipped to identify, inform and enact better solutions (Scherr et al. 2013; Reed et al. 2016; Erbaugh and Agrawal 2017). In recent decades, ILA have been increasingly invested in across the international environmental and development realms (DeFries and Rosenzweig 2010; Reed et al. 2016; Kremen and Merenlender 2018). To further facilitate their

implementation, recent research has developed guiding principles (Sayer et al. 2013; Arts et al. 2017; Bürgi et al. 2017; Djenontin et al. 2018; Ros-Tonen et al. 2018), typologies (Carmenta et al. 2020), governance evaluation mechanisms (Kusters et al. 2018) and decision-support frameworks (McGonigle et al. 2020). Together these contributions emphasize the importance of adaptive management, stakeholder involvement, and the challenge and imperative of reconciling multiple objectives. Yet there remain considerable challenges due to the complexity of ILA, suggesting the need for a tool that facilitates a quick yet informative self-reflection and performance assessments by landscape leaders, implementers, and partners.

An influential contribution concerning principles of best practice in ILA (Sayer et al 2013) defines ten principles that should enable a landscape approach to reconcile agriculture, nature conservation, and other competing land uses (2013). The principles cover diverse elements such as embedding learning and adaptive management, soliciting and addressing common concerns, recognizing the relevance of multiple scales among others. Despite this widely recognized framework of principles, persistent implementation, evaluation, and adaptive management challenges remain (Vermunt et al. 2020; Pedroza-Arceo et al. 2022). Common causes of the 'ILA complexity gap', inter alia, include existing sectoral divides (Reed et al. 2020), insufficient monitoring and impact assessments (Sayer et al. 2017), underrepresentation of certain impact domains (Carmenta et al. 2020), inadequate engagement of diverse stakeholder groups (Reed et al. 2019), and dealing with the long-time planning horizon (Estrada-Carmona et al. 2014; Zanzanaini et al. 2017). Because of these challenges, many landscape initiatives struggle to transition from theory to practice and lack generalizable learning after implementation (Reed et al. 2017; Sayer et al. 2017). This challenge between concept, implementation and knowledge is particularly visible when there is lack of consensus, for instance on the appropriate spatial scale, configuration of actors or what constitutes equitable distribution of resources (Reed et al. 2020; Ros-Tonen and Willemen 2021; Ros-Tonen et al. 2021).

Here, we develop and present a tool—an ILA mixing board—for stakeholders, in particular project managers, that structures the complexity of ILA into selectable and scalable attributes in a replicable way. This tool aims to i) facilitate the planning and decision

making around ILA goals; ii) provide a transferable and efficient diagnostic aid to categorize ILA, and iii) offers a structure for ILA

assessment and evaluation.

# Methods

## Scoping

Our approach consisted of five methodological steps (Table 1). The first three steps were part of a scoping process to 1) identify the

most salient gaps that inhibit progress towards ILA implementation; 2) identify key concepts (such as learning, scope, accountability)

from management and planning realms to 3) develop guiding questions which are relevant for dialogues between stakeholders within

and about landscapes. These questions were then linked with the ten principles (Sayer et al. 2013) through scalable, actionable, and

measurable gradients. For the first three steps, a foundational focus group discussion (FGD, June 2021) and a parallel literature

review (June – August 2021) were held. Aim of the FGD was to juxtaposition and complement the scientific literature on best

practice to on-the-ground application experience in relation to ILA implementation. Here, we assembled ten experts from a leading

organization in tropical landscape approaches in two rounds of a total of eight hours of discussions. The assembled expertise covered

the following: tropical geographies (Latin America, sub-Saharan Africa, Southeast Asia), over 100 years of cumulative project

management experience; inter- and transdisciplinarity (with topical focus on landscape management, agriculture, human geography,

ecology, social anthropology, social and political sciences). The outcome were seven main guiding questions relevant for landscape

approaches (Figure 1). Each question represents a qualifier that is rooted in a concept from the natural resource management and

planning realm.

## Design

Step 4, the definition and characterization of qualifiers, was based on a review of a wide range of regionally defined case studies

from the published literature in the fields of land use planning, water resources management, landscape, and urban planning (see

detailed breakdown of sources in Supplementary Table S1). The qualifiers were: *Learning* as part of systems thinking from

operational research (Checkland 1985); *motivations* for environmentally relevant actions as part of behavioral economics (Brekke

et al. 2003; Carlsson and Johansson-Stenman 2012); *scope* as part of multi-objective landscape management (Estrada-Carmona et al. 2014), which includes scales (Berkes 2000), stakeholders (Freeman 1984) and functions (Naveh 2001); *power distribution* as part of participatory processes (Arnstein 1969), *inclusiveness* related to collective action (Ostrom 2000; Fraser 2009), *accountability* as the institutional part of decision-making processes (Willemen et al. 2018), and *risk management* as part of forward-looking landscape planning approaches (White et al. 1997). We constructed these qualifiers, having in mind the initial questions from Step 3 and the extremes of the potential answers based on imaginable outcomes for each concept which defined the range of each qualifier. For consistency, the replies translated into a structure of five non-normative sub-units (switches) for each of the seven qualifiers of the ILA mixing board tool (Figure 1). We labeled the switches in a general way to make them transferable to multiple contexts (Supplementary Table S1). The switches aim to facilitate a quick yet informative self-reflection and performance assessments by landscape leaders, implementers, partners.

## Application

Finally, in Step 5, we outlined three case studies to demonstrate the application of the ILA mixing board tool. The three landscape approaches contrast in scope, geography, spatial and temporal scales, theoretical framework, and methodologies and so demonstrate the wide range of applicability of the seven qualifiers and 35 switches that embody the overall mixing board. We evaluated the case studies based on the literature and our own (authors FK, CG, PW) familiarity with the landscapes. This post-hoc evaluation process consisted of turning switches on, while allowing more than one switch per qualifier if needed. The resulting position of the gauge is based on the average location of the switches from left to right. The overall complexity of the ILA is based on the average position of all seven gauges. The more the gauges are towards the right side of the board, the higher the complexity of the ILA, which comes both with costs and benefits.

Table 1: Methodological steps. To develop the ILA mixing board tool, we performed five sequential steps (ILA gaps, planning dimensions, ILA principles, assembling mixing board, apply mixing board to case studies) based on FGD, literature review, expert assessments. The ILA mixing board is a tool that facilitates planning or assessment and evaluation of integrated landscape approaches (ILA).

| Step | 1 | 2 | 3 | 4 | 5 |
|------|---|---|---|---|---|
|      |   |   |   |   |   |

| Objective | Identify gaps in ILA implementation | Define relevant planning dimensions | Link principles (Sayer et al 2013) with planning dimensions through key questions | Define ranges and switches to turn dimensions into qualifiers that constitute the mixing board | Apply mixing board to case studies |
|---|---|---|---|---|---|
| **Method** | Focus group discussions, ILA literature review | Review of key manage-ment and planning literature | Focus group discussions | Review of literature on ILA and landscape management | Expert-based assessment |
| **Key terms** | | *Dimensions* = Key Mgmt. concepts | *Principles*= Ten principles for a landscape approach (Sayer 2013) | *Qualifier*= Row of the mixing board tool corresponding to one dimension, consisting of five switches. *Range*= range of values that a qualifier can take. *Switches*= basic unit of the mixing board that can be switched on an off. | *Mixing board tool*= consists of seven qualifiers each with five switches and one gauge (which will change position based on the configuration of activated switches) |
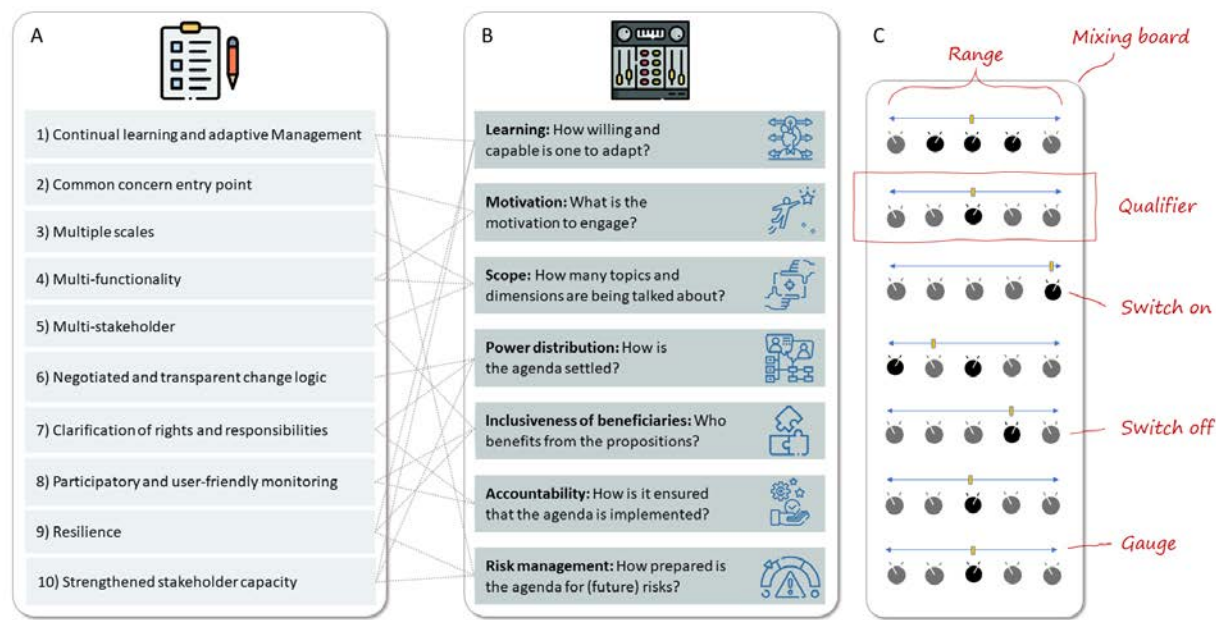


Figure 1: Developing a mixing board tool for ILA planning or assessment and evaluation. Linking the ten principles of landscape approaches (Sayer et al. 2013) (A) with the seven guiding questions (B) used to develop the ILA mixing board tool (C). Guiding questions are based on key concepts from the natural resource management and planning literature. The ranges of each qualifier are based on literature and personal expertise in the expert group. The 5-point scale of switches is not meant to represent the psychometric responses of a Likert scale (viz., highly disagree, disagree, neutral, agree, highly agree); it is also not to be mistaken with commonly used normative star-rating systems such as for hotels, but

simply follows this established number of levels. Multiple subdivisions could be created at an increased cost to define each qualifier (Matell and Jacoby 1972).

# Results

## The ILA mixing board tool

The ILA tool with its qualifiers, switches, and gauges (i.e., ILA dimensions and characteristics, Figure 1, see Supplementary Material for details) relate to the project landscape under scrutiny. The qualifiers of learning, motivation and scope are classic planning dimensions (Figure 2)—how to approach the landscape in this context? The **learning** qualifier relates to questions around flexibility and certainty/uncertainty of the beliefs held by those leading, i.e., planning and managing, the ILA: Are the working hypotheses defined and predetermined based on other experiences and landscapes, or is the project entering the unforeseeable system with the epistemology of grounded theory to discover an emerging theory (Levers 2013)? The **motivation** qualifier implies motivations and interests: Why engaging in the landscape and what motivation brings together different stakeholders? Does the project address specific threats (e.g., flood risk), or needs (e.g., more agricultural output); or does it follow explicit targets (e.g., community based management areas), is the project based on principles (e.g., the polluter pays principle), or does it follow a broad mission ("Forests for all forever", an example by FSC 2017)? The **scope** explores the breadth and depth of the ILA project: How wicked is the problem, or how broad is the discussion? How many topics, spatial scales, ecological functions, or different stakeholder groups are being targeted in the planned ILA? The range goes from one or very small, to few, main, many, and ends with all and everything.

The qualifiers of power and inclusion (Figure 2) deal with the project relations—what are the people to consider and what are their interactions with the project? **Power** is defined here as the potential to influence the process. The switches are based on Arnstein's (1967) ladder but only within the range of ethically accepted research for development practices. The names of the switches are to be understood as technical terms, as modus operandi where the level of participation describes the stakeholders' contribution to and

interaction with the project and ultimately reflects their decision-making power. The qualifier of **inclusiveness** refers to the perspectives, foci or knowledge systems considered by the project. The range spans between the me and the us, and moves along the ladder from individual, tribe, the others, to everyone (e.g., the wider social system), and everything (e.g., people and the environment). At the minimum end, an ILA can focus on "my own company, my own plantation"; on the opposite end, an ILA considers the interests of all living beings and things.

The qualifiers of accountability and risks refer to the governance of a project. The **accountability** qualifier deals with the proximate levels of project implementation. The qualifier range spans from horizontal accountability, describing agreements between more or less equal stakeholders or institutions (cf. O'Donnell 1998) to vertical accountability, relationships between unequals. Its switches contain types of accountabilities that are commonly referred to (Lindberg 2013; Willemen et al. 2018). The **risk management** qualifier refers to the management of a key component of intractable problems. How does a project account for inherent future risks? The qualifier ranges from inert (reductionism with identified cause-effect relationships and predictable sub-systems) to agile (a system consisting of high numbers of interconnected and interacting components with unpredictable emerging characteristics, Chester et al. 2021). The switches span from rigid (increased vulnerability to risks and change, Gunderson and Holling 2002) to bendable (an attribute that is less vulnerable to risks than the previous one but which is not as ready to absorb shocks as its switch to the right), resilient (the capacity to absorb shocks while retaining functionality, Walker et al. 2004), adaptable (the capacity to influence resilience, Folke et al. 2004), and transformable (the capacity to embody risks and fundamentally change the system, Folke et al. 2010).
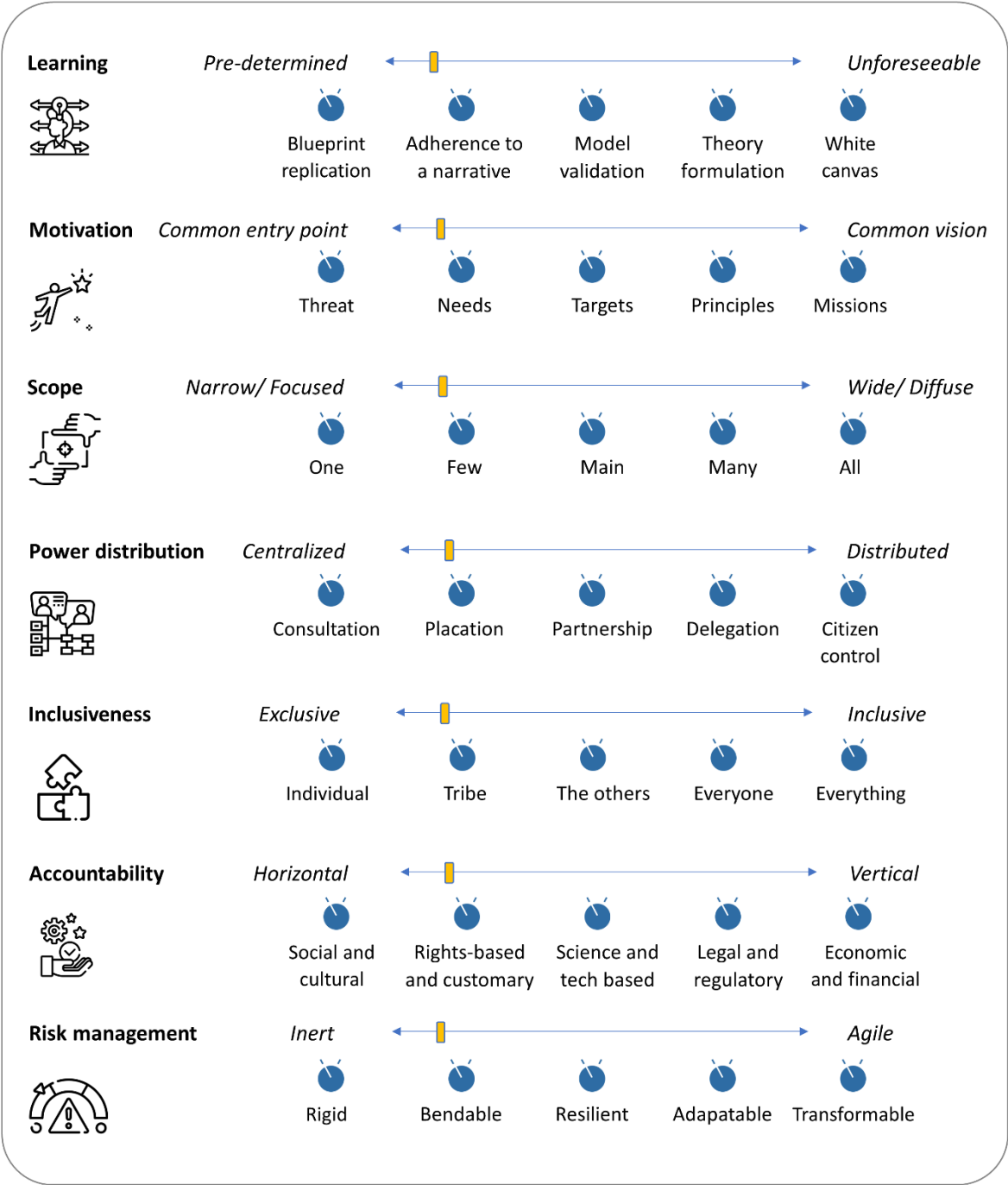
Figure 2: ILA mixing board tool. Each of the seven planning or assessment dimensions are represented by a qualifier that is in turn linked to five switches to be activated in response. Depending on the number and configuration of activated switches, the gauge (yellow shape on the blue line) will move between two extremes of the qualifier range. All the elements listed here are to be understood as descriptive in nature and not as normative goals. The ranges do not represent from worst to best or vice versa; they are non-judgmental and value neutral. See Supplementary Material for additional explanation of terms and foundation in the literature.

## Applying the ILA mixing board tool

We apply the ILA mixing board tool to three existing case studies in tropical landscapes to illustrate the utility of the mixing board tool for ILA assessment and reflection (Figure 3). This approach means that the operator of the tool will zoom into respective case study to turn on or off the attributes best describing the project in respective landscape.
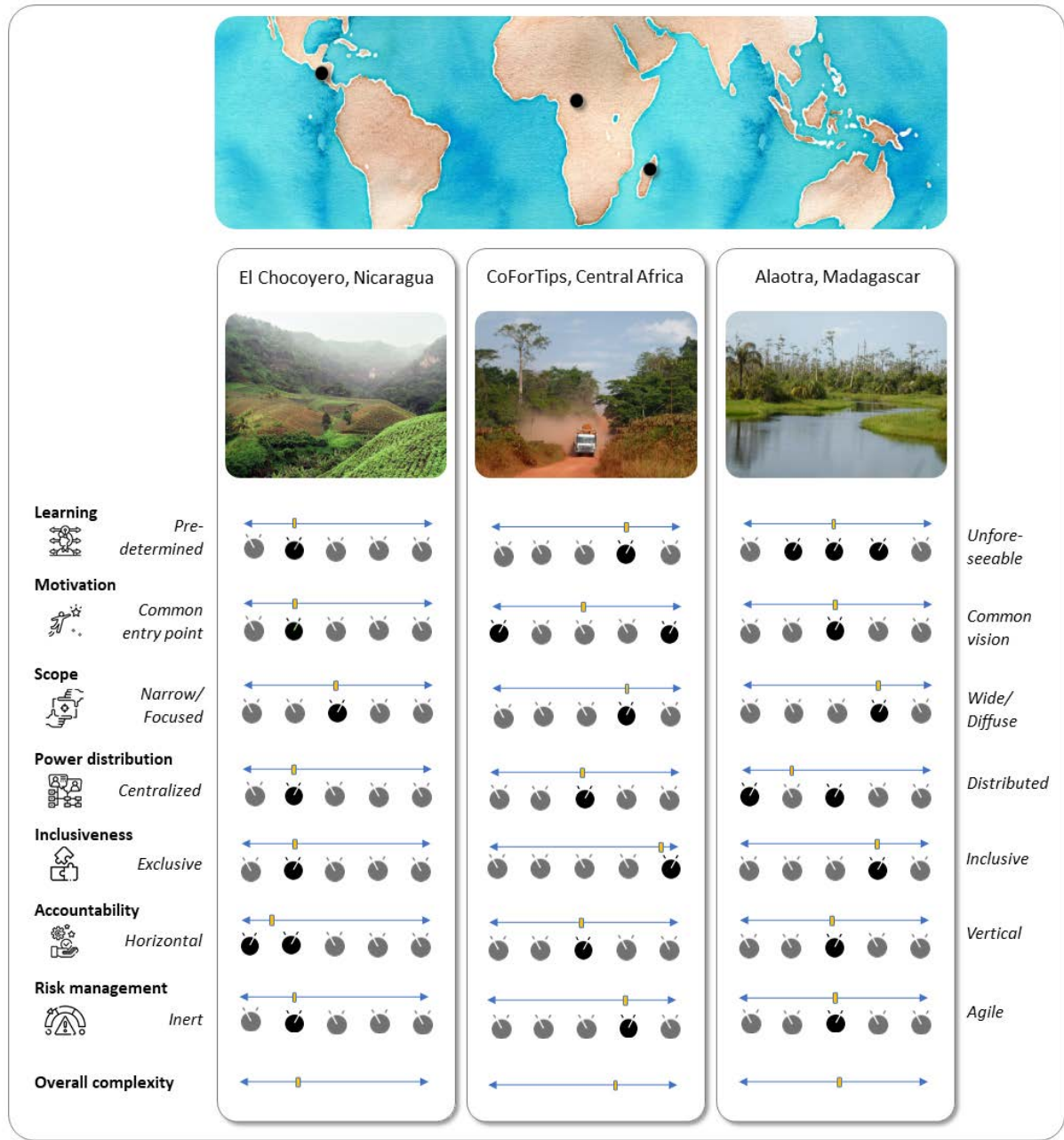


Figure 3. Application of the ILA mixing board tool for post assessment. The cases represent different spatial and temporal scales and differ in their socio-economic characteristics. The switches are turned on (dark) or off (gray) according to case assessment. The gauge position depends on the active switches. To handle the ILA mixing board tool familiarity and expertise with respective projects are required.

The Chocoyero-el-Brujo forest reserve in the municipality of Ticuantepe in Nicaragua contains water sources that are used by a local CAPS (Comités de Agua Potable y Saneamiento), a community-based initiative that accesses, distributes and maintains local water resources (Romano 2017) for the communities of El Eden and Los Rios, benefitting a population of around 5000 people (Kreimann Zambrana and Acevedo Jirón 2006). The common necessity to distribute and conserve available water is what originally motivated and continues to sustain the bottom-up initiative of an agricultural cooperative to protect the forest since the 1980s. The learning dimension is *adherence to a narrative* and the motivation is based on *needs*. The scope of the approach includes the *main* actors and elements of this social ecological system (Kreimann 2014). The overall power distribution is at the *placation* level, as most people in the community benefit from the landscape as water users. Yet not all members have an equal say in the negotiations and marginalized groups and women are underrepresented in the process (Kreimann Zambrana and Acevedo Jirón 2006). The inclusiveness is therefore at the *tribe* level. The accountability is mostly ensured through *social and cultural*, *rights-based and customary* approaches. Overall, the initiative cannot be considered fully resilient, as conflicts arise when resource availability becomes more severe (Kreimann 2017). The risk management strategy is at the *bendable* level.

CoForTips (Forest of the Congo Basin: Resilience and Tipping Points) worked to foster better management of the forests and landscapes in the Congo Basin. The project was led by a coalition of research institutions and NGOs including WWF Central Africa and IUCN between 2014 and 2018. The learning level chosen by the project at the onset was *theory formulation* and it remained at this position throughout most of the project. The loss of rainforest was an emerging issue in the Congo Basin at the time of drafting the project (Scholes and Biggs 2010), while the level of threat on biodiversity had been comparatively low compared to other regions in Africa, given low human pressures, low rates of endemism and large species distribution areas (Burgess et al. 2006). The motivation that brought people together was the long-term perspective and the *mission* to ensure better management for the landscapes of the region. Some individual components had necessarily a narrower focus (e.g., livelihood strategies of local Bantu farmers to changes in their landscape). The interdisciplinarity of the project and the set of project partners, however, ensured that

the scope of the project consistently kept a *many* if not *all* approach to the landscape dialogues (Garcia et al. 2022). The participatory modeling approach in the project design (Barreteau et al. 2003) allowed to empower stakeholders in defining research questions, selecting study sites and identifying target beneficiaries. Yet, the flow of funds to certain partners was restricted by funding agencies' rules. Hence, the appropriate descriptor for the power and control qualifier is *partnership*. The strong emphasis of the project on collectively building scenarios for guiding decision-making positions the accountability descriptor as *science and tech based* contributing also to an *adaptable* strategy for managing risk.

AlaReLa (Alaotra Resilience Landscape) was a research for development academic project (2013–2017) which aimed to understand the social-ecological system (SES) Alaotra, the fish and rice production center in the NE of Madagascar. The approach taken was one of exploration through participatory modeling, where room was given for surprises to emerge and learn (Reibelt et al. 2019). The learning approach was characterized by both *adherence to a narrative* and *model validation* (Bodonirina et al. 2018; Reibelt et al. 2019). Given the advanced environmental destruction (Lammers et al. 2015) combined with an increasing hardship for the average rural resource users to maintain a livelihood (Copsey et al. 2009a, b; Rakotoarisoa et al. 2016), the clear project motivation was at the *target* level, given the specific aim to reduce degradation of the Lake Alaotra wetlands, which are crucial for the fish stocks (Pidgeon 1996),  endemic biodiversity (e.g., *Hapalemur alaotrensis*, the sole primate on earth to live permanently in marshes, Waeber et al. 2018), and for meeting an increasing demand for water for agricultural production (Ferry et al. 2009). The entry level of the project was set at *main* representing a medium range scope. *I*n the end, the project ended up with a clear understanding of few specific cases only, such as perception towards conservation (Reibelt et al. 2017; Waeber et al. 2018a) or gained an understanding of the attitude towards forest governance in the Zahamena (IUCN I) protected area (Bodonirina et al. 2018), or the rice value chain, from production to local, regional, and national markets (Ravaka et al. 2019). The project invested more than the standard amount of time in project inception (some twelve months) to engage with various groups of stakeholders, for diagnostics of the SES, to learn about the system, considering different strands of knowledge, to formulate the main problems

together with the different stakeholders, rendering more than one level of power distribution, with the gauge averaging its position.

Though AlaReLa project came much closer to reach its main goal of understanding the Alaotra SES, it did not encourage any policy changes.

Every ILA project is different, just as the people and their goals and interactions within the landscape are different. The ILA mixing board tool provides an almost universally applicable framework for a large variety of situations without oversimplifying, as shown on the example of the three case studies. While it is clearly not the purpose of the tool to compare which ILA is better or worse than another, it allows to assess the degree of complexity addressed in the design and practice of each ILA. Increased complexity comes with higher costs to implementation. A bottom-up, long-term community-based initiative such as the case in Nicaragua may not be able to afford the costs of embracing full complexity. In contrast, a research-driven project such as the one in the Congo Basin was designed as a short-term approach to embrace a high degree of complexity. The mixing board tool allows comparing such highly contrasting ILA and provides visual clues that trigger the imagination of people involved in ILA about which aspects they want to improve.

## Discussion

Integrated Landscape Approaches have been supported by many international organizations (Freeman et al. 2015), but challenges remain on how to best address the complexity gap especially in the face of a missing universally acceptable definition of ILA. The proposed mixing board tool for ILA planning, assessment and evaluation helps characterizing and structuring inherent complexity. With limited resources but growing pressure to find solutions to wicked problems, evidence is key for increasing future efficiency in the context of landscape approaches (Pullin and Knight 2009; Tengö et al. 2014; Downey et al. 2021). This means, inter alia, to avoid past mistakes when planning for future landscape interventions. The mixing board tool systematically describes ILAs to learn from and can serve as boundary object for stakeholder discussions. In the following we discuss the application as a planning support tool in detail, while also highlighting the limitations.

## Comparative appraisal

To take stock of the many ILA done around the globe, and to avoid common mistakes with future projects, appraisal is a commonly accepted way to identify drivers and barriers to implementation and effectiveness (Antrop 2000; Carmenta et al. 2020; Vermunt et al. 2020). With the ILA mixing board tool, both comparative appraisal between ILA, as well as inward looking appraisal are made possible. This type of assessment is useful if we are to learn from the numerous ILA operating around the world. The ILA mixing board tool has been used by experts highly familiar with the projects to zoom into three specific and finished projects, to operate the switches and read the gauges. The tool not only highlighted the diversity of the projects (by setting the switches), but its gauge function allowed to emphasize a key aspect which would elude assessment when focusing on details only: while the Nicaragua project's gauges are mostly to the left of the complexity range, the Central Africa project gauges are mostly on the opposite end of complexity; the Madagascar example is somewhere in between. The tool also evidenced a shared commonality of the projects: All our case studies illustrate larger underlying institutional and governance issues that were left un-dealt, which hampered the overall impact of the projects. The use of the ILA mixing board can create awareness of such issues and nudge management towards resolving them.

While we consider the ILA mixing board to be a boundary object or concept (Westerink et al. 2017) to reach consensus on project planning or evaluation and to set project targets, it does not challenge the underlying institutional conditions. With the help of the mixing board tool, we were able to juxtaposition the three cases despite totally different socio-economic, political, environmental, and cultural realities, and different project ambitions, goals, and consortiums. As a tangible and dynamic tool, the mixing board can help clarify common misconceptions about ILA and provide alternative ways of thinking and talking about the integration issues of landscape approaches. ILA are not about physical landscapes so much as they are about what people (e.g., resource users and decision-makers) say about a landscape and how they say it. This is important, because landscapes are not only physical spaces, but they include people's sense of place, based on perceptions and narratives (Verbrugge et al. 2019; Kleinschroth et al. 2021).

Landscape boundaries can be both biophysically determined and social constructions that can be developed upon biophysical discontinuities (Rose and Wylie 2006; Pfund 2010).

## Boundary object

The advantage of the ILA mixing board tool are its' intuitive switches so also laymen people can discuss their landscapes and futures. In other words, this mixing board tool can also be used as a boundary object (sensu Star and Griesemer 1989; Star 2010). Bringing stakeholders—with different worldviews, values, needs, desires, and sometimes conflicting agendas—together in a participatory fashion to discuss and decide where their ILA sits and why such a project may or may not have various advantages. It can increase stakeholder engagement as per Arnstein's participator ladder (Arnstein 1969), which has the potential to increase a project's legitimacy and thus ownership within affected communities (Mathur et al. 2008). Such meetings can identify potential barriers to ILA implementation and allow for timely mitigation measures (Holcombe and Anderson 2010; Jemberu et al. 2018). The type of reflection can enable stakeholders to discuss together how they may want to reorientate the ILA and define what progress they would like to see in coming years (Garcia et al. 2022).

## Limitations and future research

There is a high cost to pay to activate more switches on the mixing board, and different landscape configurations call for an adaptation of the way the landscape approach is conducted. Further, ILA come with other challenges that remain outside the capacity of our tool: difficulties engaging the private sector (Estrada-Carmona et al. 2014; Reed et al. 2020), lack of funding and institutional support (García-Martín et al. 2016; Zanzanaini et al. 2017) or overlapping incompatible policies and structures (Vermunt et al. 2020; Forsyth and Springate-Baginski 2021) to list some aspects of the ILA complexity gap. The most prominent aspects of it, however, can be addressed by the framework presented here. A caveat of the ILA mixing bord as a project assessment and evaluation tool is that the decisions, whether by experts or by stakeholders, on turning a switch on or off are only based on what has happened so far and could change over time. For example, we do not know how 'bendable' risk management of an ILA project would be in the face

of a war, or an immense drought. Further, the tool does not allow to simulate projections into possible or plausible futures (sensu Lindgren et al. 2003).

While it often seems detrimental to have landscape approaches that seem to somehow 'muddle through', we argue that some degree of this is inevitable. The best laid management plans cannot account for black swan events, the COVID-19 pandemic being a timely case in point. Bringing the mixing board into practice can help planners and decision-makers to think beyond often misconceived logframes (Sayer and Wells 2004). For example the ten principles by Sayer et al (2013) can be ticked off like in a tick list while it might remain unknown to what extent a principle has been fulfilled or addressed (Sayer et al. 2017); alternatively, project planners may opt for selective "cherry picking" from the principles. To attenuate such risks, the ILA mixing board tool, which covers and embraces all principles, with tangible and scalable attributes, ensures that ILA planners consider every aspect of project management. The ILA mixing board tool sets the path for additional analysis that could seek to explore how outcomes are related to the position of the mixers, and to the various combinations. What combinations should be a target in a particular landscape? Or in situations of conflict? It is not the focus of this paper, however, to quantify how frequent the different configurations of the switches are, or how they co-vary. These valid questions are left for future research. Applying the mixing board tool to the three case studies–Nicaragua, Central Africa, Madagascar–illustrates the levels of nuance that are needed given existing overlaps and uncertainties in practice and at the same time justifies the chosen degree of generalization.

## Conclusions

Researchers and practitioners all agree there is no one-size-fits-all approach to landscape approaches (Sayer et al. 2017; Bennett and Satterfield 2018). The ILA mixing board tool caters for this diversity, by allowing for a high number of configurations. Some problems require more complexity to be embraced, while others require more focus (Gardner et al. 2009; Boedhihartono et al. 2018). In other words, there is not one right way to conduct an ILA. The position on the gauges, depending on which ILA characteristics are present or absent (switches), the way the approach is conducted, can change, must change, to respond to a changing environment,

setting of new goals, and adjusting to available resources within the landscape and of the project that is working towards an ILA.

Application of the mixing board tool can raise awareness of the contextual issues faced in the landscape and direct management towards identifying appropriate responses. We see the ILA mixing board tool as a way forward to systematically describe the large diversity of ILA, leading to more informed choices about the allocation of available resources and guidance for context-specific implementation of ILA into practice.

# Acknowledgements

# Supplementary information

Table 1: Examples from published peer-reviewed literature for each switch of the seven qualifiers

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