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Identifying Forest Degradation and Restoration Opportunities in the Lancang-Mekong Region: A Tool to Determine Criteria and Indicators

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Abstract: Forest restoration is increasingly becoming a priority at international and national levels. Identifying forest degradation, however, is challenging because its drivers are underlying and site-specific. Existing frameworks and principles for identifying forest degradation are useful at larger scales, however, a framework that includes iterative input from local knowledge-holders would be useful at smaller scales. Here, we present a new mechanism; a framework for developing criteria and indicators that enables an approach for the identification of forest degradation and opportunities for restoration in landscapes that is free from failures that are often inherent to project cycles. The Degradation and Restoration Assessment Mechanism (DReAM) uses an iterative process that is based on local expertise and established regional knowledge to inform what is forest degradation and how to monitor restoration. We tested the mechanism's utility at several sites in the Lancang-Mekong Region (Cambodia, Laos, Myanmar, Thailand, and Vietnam). The application of this mechanism rendered a suite of appropriate criteria and indicators for use in identifying degraded forests which can help inform detailed guidelines to develop rehabilitation approaches. The mechanism is designed to be utilized by any individual or group that is interested in degradation identification and/or rehabilitation assessment.

Keywords: Lancang-Mekong Region; forest degradation; restoration; criteria; indicators; assessment

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1. Introduction

Forest loss and degradation are global issues that are of increasing public concern, garnering international and national commitments to mitigate or reverse these trends. International agreements such as the Bonn Challenge, Convention on Biodiversity (CBD) Aichi (15) Targets, Sustainable Development Goals (SGD) Targets (15.3), and the New York Declaration on Forests highlight the level of government urgency to halt deforestation and restore degraded areas. The United Nations recently designated this decade (2021–2030) as the Decade on Ecosystem Restoration [1].

The Asia Pacific region has seen high levels of deforestation and forest degradation as many of its countries have experienced unprecedented land-use change over the last four decades. The most recent Forest Resources Assessment estimated that Asia had an overall loss of naturally regenerating forest in the amount of 386,000 ha per year from 2010 to 2020, due mainly to losses in South and Southeast Asia [2].

Regional forums, such as the Asia-Pacific Economic Cooperation (APEC) and The Associations of Southeast Asian Nations (ASEAN), have committed to increasing forest area and resources in support of government goals that are outlined in the countries' Nationally Determined Commitments (NDCs), Sustainable Development Goals (SDGs), and other

international commitments to sustainability. Restoring degraded areas is a uniquely accessible opportunity for stakeholders to increase biodiversity, carbon stocks, and the quality of ecosystem services at low-cost. Many efforts have been undertaken to target high-priority sites for restoration in Asia Pacific countries that are at high risk for deforestation and forest degradation. This is particularly true for the Lancang-Mekong Region (LMR), which is comprised of Cambodia, Lao PDR, Myanmar, Thailand, Vietnam, and parts of Southern China (Yunnan Province and Guangxi Zhuang Autonomous Region). While forest area is said to be increasing in Lao PDR and Vietnam, the countries are both losing primary forests at high rates [3]. Cambodia and Myanmar are experiencing high levels of all forest loss (including both primary and secondary forests) [3], while deforestation and forest degradation in Thailand's watersheds is becoming a major concern [4].

In order to address forest degradation, it is first necessary to be able to define what it is and to identify the processes that affect it. This task is challenging as forest degradation and its drivers are unique to time and place. A one-size-fits-all approach to identifying degradation is difficult to achieve as the state of a restored area is defined differently by different audiences. What constitutes successful reclamation of a mining site is different from expectations of ecological restoration of habitats, where the focus can shift between ecological structure, function, and complexity [5,6]. There currently exists a multitude of frameworks that can be used to assess land degradation and restoration. The Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) published a framework for the global assessment of land degradation, the Food and Agriculture Organization (FAO) introduced their Restoration Opportunities Assessment Methodology (ROAM) at national and subnational levels, and Gann et al. (2019) recently updated the International principles and standards for the practice of ecological restoration (SER) [7–9]. However, while these frameworks are global in scope and the methodologies offer indicators that are purposefully ambiguous for the sake of universal application. This approach can yield generalized information on degradation and restoration that may not be helpful for specific case sites. Furthermore, these approaches also presume major financial and structural supportive systems of those that are conducting the restoration initiative and may not be appropriate for sites of smaller sizes and scales at which these supportive structures may be less accessible. Site-specific degradation must be understood by its underlying drivers which are often specific to the social, economic, and political context. Rather than supplant these approaches, our tool is meant to augment their efforts through its usefulness at the project-level.

This is a follow-up paper to our previously published review on the current issues related to forest degradation in the LMR [10]. While the first study provides an updated overview of the drivers of forest degradation in the region, this study offers a new management approach. The aim of this research was to establish a framework for developing criteria and indicators that define landscape degradation and identify opportunities for restoration, referred to here as the Degradation and Restoration Assessment Mechanism (DReAM). The objectives of this study are to describe the elements of DREAM and evaluate its field test application. In order to assess its utility, we applied the mechanism to various sites of forest degradation across countries of the LMR. The following is a description of the mechanism and an analysis of its applicability.

2. Materials and Methods

2.1. Description of the Study Sites

The Lancang Mekong Region (LMR) is located in Southeast Asia, which contains about 15% of the world's tropical forests. The Lancang–Mekong Region (LMR) crosses the borders of six Southeast Asian countries: Cambodia, Lao PDR, Myanmar, Thailand, Vietnam, and four provinces of southern China. The region is comprised of diverse forest types that provide food, livelihoods, and other ecosystem services to tens of millions of people. This report focused on the first five countries, excluding southern China.

The forest types in the LMR are diverse between and within the region's countries. The region's major forest types include evergreen forest (dry and secondary evergreen), deciduous (deciduous dipterocarp forest and mixed deciduous), hill evergreen forest, and swamp forest [11–15]. The drivers of degradation are specific to each country. In Cambodia, they include illegal expansion of agriculture, as well as infrastructure and settlements [16]. The leading drivers of degradation in Lao PDR include logging, agricultural expansion [12]. The direct drivers of degradation in Myanmar include over-harvesting, illegal wood harvesting, and over-grazing [13]. The direct drivers of degradation in Thailand include population growth, the extension of permanent and shifting cultivation, poorly planned and managed logging by concessionaires, and illegal logging [17]. The direct drivers of degradation in Vietnam include conversion to agriculture, infrastructure development, unsustainable logging, and forest fires [18].

2.2. Methodology

We co-constructed a mechanism to help define a management ethos by deriving a framework for understanding elusive concepts of degradation and restoration and then translating that ethos into a tool (a set of criteria and indicators among three integrated tiers of inquiry). This tool is designed to be utilized by any individual or group that is interested in degradation identification and/or rehabilitation assessment. For this project, it was applied by a wide range of stakeholders, including NGO members, local land managers, and academics that oversaw rehabilitation projects throughout the LMR. The tool's flexibility lends itself useful to projects with specific aims. The mechanism enables continued adaptation and learning so that restoration activities logically flow from more critical and deeper understandings of degradation.

First and foremost, it is important to note that degradation is a fluid concept. It is a societal construction, meaning it is framed subjectively by humans against some desirable forest values. These values are not always objectively measurable sets of variables of ecosystem functionality. The definitions and societal perceptions of forests and their health are dynamic. The below figure highlights the fluid nature of how society frames "forest health" (Figure 1).

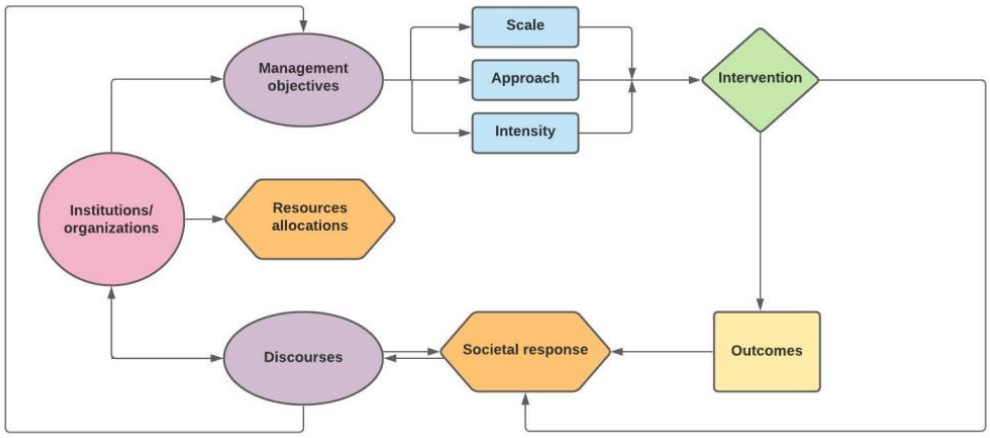

Figure 1. Framing forest health.

Forest degradation must be considered as part of broader forest landscapes. Therefore, degradation is a people-centric concept and exercise; organizations cannot and should not attempt to identify degradation on their own because the full range of stakeholders will often perceive different scenarios for a desirable forest landscape.

Among these divergent perspectives (cultures and economic interest groups, etc.) views often conflict on how to use and govern forest landscapes. There have been numerous attempts to address the difficult tasks of conceptualizing and assessing forest degradation—no universal approach is applied.

As such, no universal method for defining and assessing forest degradation exists, and nor should it, considering the complexities of local contexts. Therefore, this mechanism strives to identify and encourage best practices in the framing of how degradation and restoration can be (1) identified, (2) measured, and (3) treated.

The tool was designed to be a flexible framework that is guided by data and knowledge-holders that are specific to the site of concern. The process includes inputs that are internal to the project site (regional experts and project managers) and external (existing regional literature, studies, and data). These inputs determine a list of C&Is that are relevant to the project site. These C&I's are organized into broader themes that describe the landscape governance, project process, and project outcomes and listed in tables that will be used to assess each through field tests (Appendix A). With the C&Is listed in the tables, the individual(s) evaluating the project is asked to assess the strength of each variable and how it was measured. The individual is asked to assess how relevant each is for identifying degradation and how important each is for identifying degradation through a Likert scale where "−" indicates degradation and "+" indicates rehabilitation. If there are C&I's that are important to the project site but are not listed, the individual is asked to add it to the list.

This assessment culminates in an evaluation of degradation and effective approaches to restoration. This process is iterative and can inform the baseline of a project area, assess the project's progress as it moves forward, and evaluate the project's success once it is complete. The mechanism accounts for another principle of dynamic complexity—there are direct and indirect drivers of degradation and understanding their relationships and feedbacks is vital to successful interventions.

Stakeholder involvement in issues of forest governance is a clear concern among all LMR countries. In the context of climate change, impacts on forests will likely be exacerbated. Additionally, the recent economic uncertainty that is brought by global development shocks such as the COVID-19 is leading to further governance pressures. Restoration relies on stakeholder influence and adaptation among the broad range of stakeholders that influence forest outcomes. DReAM has been developed with this in mind, to achieve learning in ways that steer restoration towards more robust, responsive, and systemic forest landscape sustainability.

3. Results & Discussion

We co-constructed an assessment mechanism, based on the principles that are established above. The Degradation and Restoration Assessment Mechanism frames restoration as part of a broader social-ecological system of a forested landscape. As such, it functions as both an ethos and a tool. It guides assessments from the first stage of problem identification to the inclusion of inputs, outputs, and the projections of the impacts of expected restoration measurements and management.

The basic elements of the framework are categorized into input, process, and output components (Figure 2). The initial stage (in yellow) defines the inputs that characterize the state and historical context of the project site. These inputs include internal considerations (consultation with local experts and stakeholders) as well as external inputs (analysis of the available data and literature reviews). These inputs feed into the tool itself (in green), helping to define the ontology of what is a forest in relation to other parts of the landscape system, and compiling and organizing the criteria and indicators into three tiers. These include landscape governance, project implementation process governance, and outcomes. When applied at the intervention level (in blue), they render an overview of the definition and extent of degradation and inform restoration intervention opportunities. Based on this application, changes are made, or resources are allocated to achieve restoration. These steps are laid out below in brief. The actual proposed tables for the three tiers of criteria and indicators for the tool are presented in Appendix A.

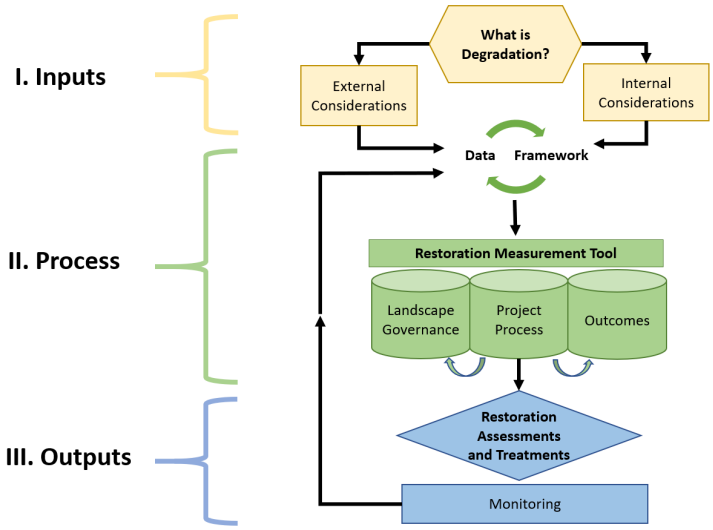

Figure 2. Framing restoration.

3.1. Inputs

The following basic inputs are applied to derive a useful degradation and restoration assessment mechanism (Table 1).

Table 1. Degradation and restoration assessment basic inputs.

External Considerations	Internal Considerations
Literature review	Stakeholder insights
Application of existing principles	Participatory diagnosis of local contexts, histories, drivers of degradation, and opportunities for restoration.
Expert Consultation (macro trends affecting forests)	Upward and downward accountability (i.e., to external experts, donors, recipients of interventions)

DReAM is based on an important underlying assumption, that achieving sustainable forest landscapes is primarily concerned with improving forest governance, and the sustainable and equitable use of natural resources within a target forest landscape. Therefore, this study emphasizes broad-based methods that will form a mechanism to help enhance stakeholder engagement and capacity, and to either establish and/or refine existing monitoring and evaluation protocols that can contribute to informing sustainable forest landscapes. These methods should help build an understanding of the institutional, socio-economic, and biophysical characteristics of the forest landscape. The approach establishes ways to understand the relevant historical characterization of the forest landscape, current challenges that are related to forest cover quality, and the potential future forest landscape trajectories of change—as perceived by those that influence, are affected by, or have an interest in forests. A further assumption is that this approach is benefitted by the reference to, and consolidation of previously formulated degradation, restoration, and forest landscape restoration principles, criteria, and indicators, by a wide range of prominent forestry research associations. Therefore building a shared ontology of how forests are relationally situated among the diverse actors influencing, affected by, and interested in forests sets the compass for steering restoration activities.

External inputs to this degradation and restoration mechanism are drawn from pre-existing literature. Any initiative should be aware and note the best practices (our case study application in the LMR was built from the work on forest rehabilitation by Lamb and Gilmour (2003), Dudley et al. (2003), Besseau et al. (2018), and Maginnis et al. (2012),

among many others, which can be found in Brewer et al. 2020 [10]. The global forest restoration community has been accused of taking a narrow view of forests [19]. As such, literature reviews for the sake of deriving principles, criteria, and indicators for assessing degradation and restoration should expand far beyond the conventional site-based approaches to restoration. Instead, they should build forest indicators according to integrated visions across sectors, disciplines, and spatial scales. Otherwise, site-based forest sectoral thinking creates bottlenecks to integrated management that ultimately inhibit rehabilitation and the sustained management of forest landscapes [19].

Internal inputs include expert consultation with subject area experts of (1) regional drivers of economic development, (2) social and cultural histories of natural resource use, and (3) governance arrangements affecting the conservation and development trajectories. This range of experts will contribute to a rich understanding of the trends of forest quantity and quality. These consultations should be held with experts of the more regional macro-level variables affecting forest-landscape development trajectories, and with a full range of local experts and actors that affect local forest-landscape outcomes. We suggest convening workshops where this diversity can collaboratively 'frame the problem' of degradation and identify actionable leverage points to achieve sustained restoration. This can be done strategically with the widest range of stakeholders to critically evaluate "restoring what? And for whom?" [20].

We stress that these inputs are iterative processes of reflection and reference in order to robustly 'frame' the issue of degradation in the forest landscape of interest, and determine how restoration might be achieved. As this document is being drafted during the COVID-19 pandemic, we are acutely aware of how large, non-local shocks can radically reframe the stressors and opportunities to local land-use sustainability. Integrating the broadest, but most focused set of criteria and indicators for a forest landscape is about inclusive participation, reflection, and critical evaluation of who governs and benefits from restoration activities and what aspects and values of the forest environment are being restored.

3.2. Process

The usability of a degradation and restoration assessment mechanism rides on the ease of tracking criteria and indicators for both. In order to capture the complexity and multi-scalar, fluid nature of degradation (refer to the principles section above), sets of criteria and indicators must address the multiple layers of governance and processes that determine outcomes. We derived a three-tiered assessment tool (using inputs as described above). The three tiers can capture (1) landscape-level governance, (2) intervention-level governance, and (3) outcomes (Table 2). Landscape-level governance refers to decision-making processes at the over-arching landscape level. Intervention-level governance refers to decision-making processes and elements at the intervention, or project, level. The outcomes define the characteristics of the intended project outputs.

The first tier describes the overarching landscape governance processes. Included in this category are a description of local leadership and the stakeholders, as well as dynamics-characterization such as transparency and shared vision. The second tier of criteria and indicators falls into what we call process governance. This tier is for ensuring good practice within an organization that is directly leading degradation or restoration activities, whether a discrete project by an agency such as an NGO or through ongoing programs, for instance by government forestry or environment departments. These are based on the fact that forest landscapes are areas of competing claims for resources, and that organizations aiming to achieve their goals need to coordinate among a broad range of stakeholders in order to make their efforts effective, and not a "displacement activity". The final tier of criteria and indicators is at the outcome level of any projects or programs. We differentiated the domains of the outcomes among those that were conservation-oriented, production-oriented, livelihoods-oriented, and those that were more institutional outcomes-oriented (such as improving how land-use plans are made).

Table 2. Degradation—three tier assessment tool.

Tier	Dimensions of Criteria *
Landscape-level governance processes	• Leadership • Stakeholder engagement • Multi-functionality • Shared vision • Process-management • System-level resilience
Intervention-level governance processes	• Connection to policy processes and key actors • Rigorous and equitable process for continuing • Stakeholder engagement • Clear and agreed theory of change • Effectiveness of governance • Transparency
Outcomes	• Conservation • Production • Livelihoods • Institutions

* Criteria and Indicator set found in the Appendix A to be determined, discussed, and verified locally.

Each tier is multi-dimensional, addressing the potential social, political, environmental, and economic traits of forest landscape degradation and restoration. In each tier and for each dimension, indicators must be chosen and tailored to local contexts in accordance with local inputs from stakeholders as described above. Participatory workshops should be held to consider the question 'what needs to happen to achieve restoration?'. We have co-established via the inputs that are laid out above, a comprehensive set of criteria and indicators that can be used to track progress—found in the Appendix A.

These three comprehensive sets that allow for tracking must be tied to local contexts. This requires asking the question repeatedly throughout an engagement or project—what values in each tier are relevant to the management objectives of a certain project or intervention? These questions are of utmost importance in the tracking of degradation and restoration. This requires re-visiting the inputs section—convening and consulting with a full range of actors that affect the local forest landscape land-use outcomes. While some projects will inevitably be more 'site or stand' focused, we assert that the broad consideration of the other indicators should be considered so that short term gains are not offset by countervailing macro-level economic, political, or environmental forces affecting the broader forest landscape; the equivalent of scoring a point but losing the match.

3.3. Outputs

After rigorously framing the indicator sets as to 'what needs to happen to achieve restoration?', agencies that are involved in forest restoration should apply the criteria and indicator framework in situ. Teams of people with in-depth knowledge of the landscape are best suited for this—especially interdisciplinary teams who have literacy across social, political, economic, environmental disciplines. People that are equipped with traditional and/or local knowledge should be included and empowered to have input on the measuring or commentary of the indicator sets. The indicator framework should not be rigid—but should be responsive to realities on the ground once attempts to measure degradation frame how restoration should offer insights as to what might be best measured and managed in local landscape contexts.

3.4. Field Test

This mechanism was trialed across the Lancang-Mekong Region from 2018 to 2020. Organizations such as the International Union for Conservation of Nature (IUCN), The World Wide Fund for Nature (WWF), The Regional Community Forestry Training Center

for Asia and the Pacific (RECOFTC), universities, government agencies, and local ENGOs, provided input and tested the tool. In addition to receiving data, we obtained feedback on the utility of the tool. DReAM was useful in uncovering the issues and shining a light on areas where interventions need to be made to improve restoration outcomes. The tool was used flexibly, depending on the stage of their project or initiative in the landscape.

The DReAM application to the LMR included inputs, processes, and output (Figure 2). The inputs included both internal and external considerations. The external considerations were approached through an extensive literature review, which included an overview of the LMR, outlining the status of forests and forest-related challenges in the region, an outline of prominent drivers of forest degradation, and a review of the use of the criteria and indicators as a tool for linking forest measurement to management. The literature review concluded with a discussion of approaches to rehabilitation, highlighting a range of current and recently completed initiatives taking place in the LMR. The internal considerations included local experts representing the five countries that were under consideration: Cambodia, Laos, Myanmar, Thailand, and Vietnam. In June 2019, a workshop was organized in Hanoi (hosted by the Vietnam National University of Forestry) where experts were invited to present an overview of the state of degradation and rehabilitation in their country. The experts that participated in the workshop included the managers of the selected project sites; regional academics with research backgrounds in forestry, environmental management, and land use science; and representatives of NGOs with high level expertise in land degradation and restoration in Southeast Asia. An exercise was performed to build consensus around the major relevant areas of focus that best reflect the regional degradation and restoration processes. These informed the criteria and indicators included in the evaluation tables (Appendix A).

Experts from five countries chose a degraded site for DReAM application. Conclusions of both the literature review and expert meetings were integrated into the initial criteria and indicator framework, which itself was refined into three tables that could be utilized by the same experts to test DReAM's utility in assessing degradation and restoration in the chosen sites. Indicators that were categorized within all three tables (landscape governance, process governance, and outcomes) were agreed upon between the experts and therefore uniformly used across the test sites. However, the specific dimensions and descriptions of the criteria and indicators were characterized by each expert according to their own assessments of each site.

Outputs of the project were recorded by each expert and synthesized in reports on site degradation and restoration opportunities. The experts evaluated the importance of each criterion and indicator within each tier, weighting them by assigning values based on five-point Likert Scale system. The same indicators were used to evaluate both defining degradation and assessing restoration. The experts were then asked to evaluate the success of each indicator with respect to the project's restoration progress. Through this process, each expert was able to determine the most important indicator of degradation in each project, identify the most important areas of focus for restoration, and evaluate the relevance of the indicators within the tier as well as the project's success.

For each tier, the project sites defined the degradation and restoration opportunities differently. For example, Cambodia and Myanmar both prioritized indicators of leadership to qualify degradation, while Lao PDR and Vietnam prioritized indicators of system-level resilience. For these countries, the absence of leadership in project sites was a major indicator of degradation. However, the top qualifying indicators within this category were unique to each project. While Cambodia valued budget sufficiency, Myanmar looked more to stakeholder engagement. Similarly, Lao PDR and Vietnam prioritized indicators of system-level resilience but had different top qualifying indicators. While Lao PDR valued assessments of ecological resilience, Vietnam valued the capacity of the site to integrate with processes at multiple scales.

Regarding the importance of indicators to restoration success, indicators of leadership were again a major area of focus. Lao PDR, Myanmar, and Thailand all assigned higher

values to indicators under this category, and again, the top indicators were different. While Lao PDR established that budget sufficiency was high priority, Myanmar looked more to marginalized stakeholder engagement, and Vietnam valued team leadership engagement the most. In contrast, Cambodia determined that the multifunctionality of a site was key to its rehabilitation, with a focus on the use of spatial prioritization tools. Thailand identified indicators of process management as important to rehabilitation, assigning a high value to management adaptation.

The data allowed for an analysis of how relevant the entire tier was to this exercise, and how successful the site was in its restoration progress. Myanmar valued landscape governance the highest for C&I relevancy, followed by Thailand, Vietnam, Lao PDR, and Cambodia. With respect to the experts' perceived project success within the context of landscape governance, Lao PDR determined their project to be highly successful, while Thailand determined theirs to be less so.

4. Conclusions

DReAM is ultimately about improving impact, as well as bridging practice with research and external agents with internal ones. Given the variability of project site influences and characteristics, the application of the tool should enable a rich diagnostic understanding first of what comprises degradation, and then where the focus of restorations interventions should go. For organizations wishing to understand how their restoration projects are succeeding or failing, the mechanism offers learning pathways. Too often restoration projects fail due to the inadequate harmonization with local governance arrangements [21]. This mechanism helps to clarify how organizations may achieve reaching their goals, pointing to the way interventions are significantly affected by nested socio-political systems that affect landscapes. The indicators that are built into the tables can be used for establishing consensus and then for tracking the trajectory of the forest landscape as interventions are made either in projects or programs that wish to steer the governance of the landscape towards futures that include healthier forested ecosystems, providing the range of goods and services that people demand of them.

Landscapes are situated within larger societies that vary in stages of development. There is uncertainty as to whether the benefits of development will be reinvested in natural capital and enhance environmental values that are associated with restoration concerns. Our tool provides insight into what variables should be considered in decision-making about current and future forest landscape scenarios. Surprises in technological advances and market opportunities often present great shocks to the trajectories of forests. However, humans make choices on a daily basis that impact forests directly. We strongly believe this tool has great utility in framing forest restoration efforts in light of these multi-layered, complex, and integrated conditions.

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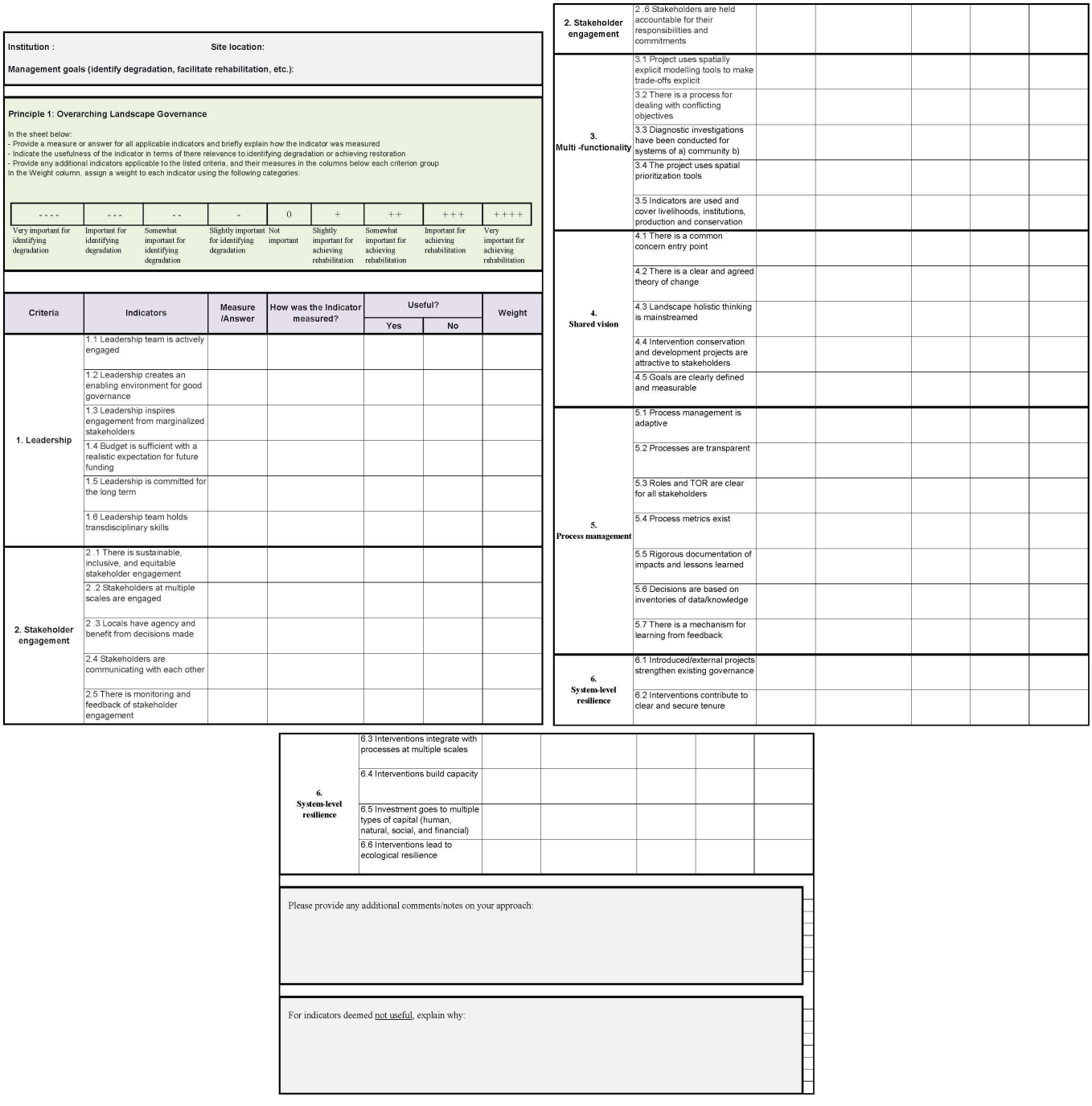
Appendix A

The following figures present the forms used to evaluate the three tiers of criteria and indicators referred to in the article are evaluation forms for Landscape Governance, Process Governance, and Outcomes, respectively.



Institution : Site location:

Management goals (identify degradation, facilitate rehabilitation, etc.):

Principle 1: Overarching Landscape Governance

In the sheet below:
- Provide a measure or answer for all applicable indicators and briefly explain how the indicator was measured
- Indicate the usefulness of the indicator in terms of there relevance to identifying degradation or achieving restoration
- Provide any additional indicators applicable to the listed criteria, and their measures in the columns below each criterion group

In the Weight column, assign a weight to each indicator using the following categories:

- - - -	- - -	- -	-	0	+	+ +	+ + +	+ + + +
Very important for identifying degradation	Important for identifying degradation	Somewhat important for identifying degradation	Slightly important for identifying degradation	Not important	Slightly important for achieving rehabilitation	Somewhat important for achieving rehabilitation	Important for achieving rehabilitation	Very important for achieving rehabilitation

Criteria	Indicators	Measure /Answer	How was the Indicator measured?	Useful?		Weight
				Yes	No	
1. Leadership	1.1 Leadership team is actively engaged					
	1.2 Leadership creates an enabling environment for good governance					
	1.3 Leadership inspires engagement from marginalized stakeholders					
	1.4 Budget is sufficient with a realistic expectation for future funding					
	1.5 Leadership is committed for the long term					
	1.6 Leadership team holds transdisciplinary skills					
2. Stakeholder engagement	2 .1 There is sustainable, inclusive, and equitable stakeholder engagement					
	2 .2 Stakeholders at multiple scales are engaged					
	2 .3 Locals have agency and benefit from decisions made					
	2.4 Stakeholders are communicating with each other					
	2.5 There is monitoring and feedback of stakeholder engagement					
2. Stakeholder engagement	2 .6 Stakeholders are held accountable for their responsibilities and commitments					
3. Multi -functionality	3.1 Project uses spatially explicit modelling tools to make trade-offs explicit					
	3.2 There is a process for dealing with conflicting objectives					
	3.3 Diagnostic investigations have been conducted for systems of a) community b)					
	3.4 The project uses spatial prioritization tools					
	3.5 Indicators are used and cover livelihoods, institutions, production and conservation					
4. Shared vision	4.1 There is a common concern entry point					
	4.2 There is a clear and agreed theory of change					
	4.3 Landscape holistic thinking is mainstreamed					
	4.4 Intervention conservation and development projects are attractive to stakeholders					
	4.5 Goals are clearly defined and measurable					
5. Process management	5.1 Process management is adaptive					
	5.2 Processes are transparent					
	5.3 Roles and TOR are clear for all stakeholders					
	5.4 Process metrics exist					
	5.5 Rigorous documentation of impacts and lessons learned					
	5.6 Decisions are based on inventories of data/knowledge					
	5.7 There is a mechanism for learning from feedback					
6. System-level resilience	6.1 Introduced/external projects strengthen existing governance					
	6.2 Interventions contribute to clear and secure tenure					
6. System-level resilience	6.3 Interventions integrate with processes at multiple scales					
	6.4 Interventions build capacity					
	6.5 Investment goes to multiple types of capital (human, natural, social, and financial)					
	6.6 Interventions lead to ecological resilience					

Please provide any additional comments/notes on your approach:

For indicators deemed not useful, explain why:

Figure A1. Landscape Governance Table.

Institution : **Site location:**

Management goals (identify degradation, facilitate rehabilitation, etc.):

Principle 2: Process Governance

In the sheet below:
- Provide a measure or answer for all applicable indicators and briefly explain how the indicator was measured
- Indicate the usefulness of the indicator in terms of there relevance to identifying degradation or achieving restoration
- Provide any additional indicators applicable to the listed criteria, and their measures in the columns below each criterion group

In the Weight column, assign a weight to each indicator using the following categories:

- - - -	- - -	- -	-	0	+	+ +	+ + +	+ + + +
Very important for identifying degradation	Important for identifying degradation	Somewhat important for identifying degradation	Slightly important for identifying degradation	Not important	Slightly important for achieving rehabilitation	Somewhat important for achieving rehabilitation	Important for achieving rehabilitation	Very important for achieving rehabilitation

Criteria	Indicators	Measure /Answer	How was the Indicator measured?	Useful?		Weight
				Yes	No	
1. Effectiveness of governance	1.1 Availability of professional and technical personnel to perform and support forest management					
	1.2 Capacity and mechanisms for management planning and the periodic monitoring of implementation					
	1.3 Links to funding mechanisms for SFM					
	1.4 Multi-stakeholder forum comprised of competent and empowered people					
	1.5 Commitment of participating stakeholders					
	1.6 Mechanisms for the equitable sharing of the costs and benefits of forest management					
	1.7 Level of access of stakeholders to advisory and support services					
	1.8 Compliance is observed (across domains)					
	1.9 Gender equity in decision making					
	1.10 Adaptive management					
1. Effectiveness of governance	1.11 Plans and management activities are implemented in line with objectives					
	1.12 Strength of local self-governing organizations					
	1.13 Capacity to enforce regulatory measures					
	1.14 Common concerns among key stakeholders					
	1.15 Incentives outweigh obstacles to SFM and rehabilitation					
	1.16 Durable legal framework					
	1.17 Secure user and tenure rights					
2. Connection to policy processes and key actors	2.1 Policies, laws, and regulations for governing forests					
	2.2 Downward accountability					
3. Rigorous and equitable process for continuing stakeholder engagement	3.1 Stakeholder inventory					
	3.2 Local (inclusive) stakeholder involvement in planning and decision-making					
	3.3 Local champions are empowered					
	3.4 Strong local networks					
	3.5 Institutionalization of appropriate mechanisms to discuss and resolve issues					
	3.6 Local stakeholder satisfaction					
4. Transparency	4.1 Multi-stakeholder participation in land-use and forest management planning, monitoring and assessment					
	4.2 Quality and accessibility of widely shared information					
5. Clear and agreed theory of change	5.1 Common concern entry point					
	5.2 Clear and agreed theory of change					
5. Clear and agreed theory of change	5.3 Theory of change based on sound science					
	5.4 Theory of change built using robustly participatory approach					
	5.5 Negotiation and communication of clear goals					
	5.6 Goals are clearly defined and measurable					
	5.7 Trade-offs are openly recognized					

Please provide any additional comments/notes on your approach:

For indicators deemed not useful, explain why:

Figure A2. Process Governance Table.

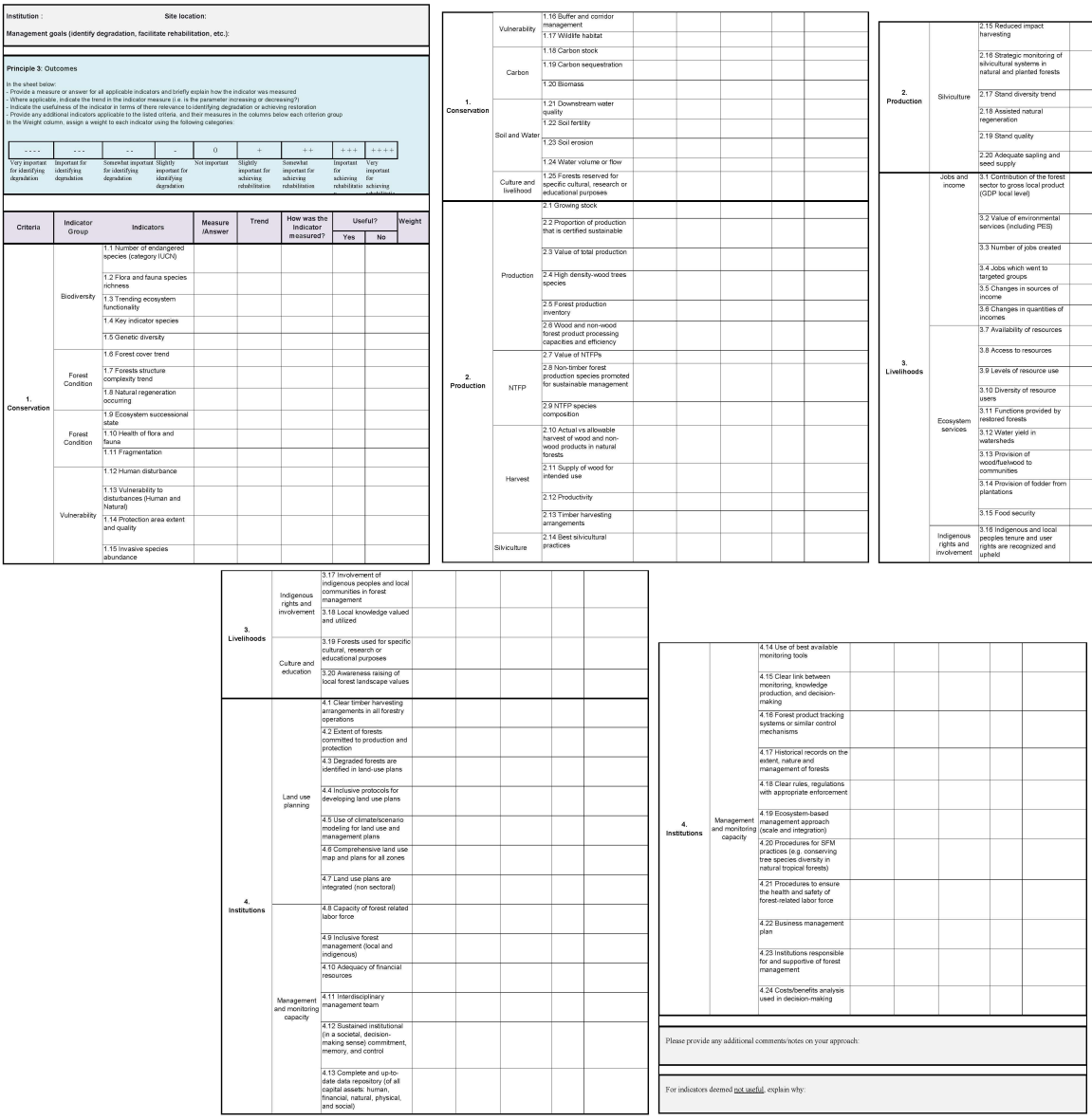


Figure A3. Outcomes Table.

References

1. UNEP. The United Nations Decade on Ecosystem Restoration. Available online: https://www.decadeonrestoration.org (accessed on 14 October 2021).
2. FRA. *Forest Resources Assessment*; Food and Agriculture Organization: Rome, Italy, 2020.
3. Gritten, D.; Lewis, S.R.; Breukink, G.; Mo, K.; Thuy, D.T.T.; Delattre, E. Assessing Forest Governance in the Countries of the Greater Mekong Subregion. *Forests* **2019**, *10*, 47. [CrossRef]
4. Dhiaulhaq, A.; Wiset, K.; Thaworn, R.; Kane, S.; Gritten, D. Forest, water and people: The roles and limits of mediation in transforming watershed conflict in Northern Thailand. *For. Soc.* **2017**, *1*, 44–59. [CrossRef]
5. Allison, S.K. You Can't Not Choose: Embracing the Role of Choice in Ecological Restoration. *Restor. Ecol.* **2007**, *15*, 601–605. [CrossRef]
6. Clewell, A.F.; Aronson, J. *Ecological Restoration: Principles, Values, and Structure of an Emerging Profession*; Island Press: Washington, DC, USA, 2012.
7. IPBES. *The Assessment Report on Land Degradation and Restoration*; Secretariat of the Intergovernmnetal Science-Policy Platform on Biodiversity and Ecosystem Services: Bonn, Germany, 2018.
8. IUCN; WRI. *A Guide to the Restoration Opportunities Assessment Methodology (ROAM): Assessing Forest Landscape Restoration Opportunities at the National or Sub-National Level*; IUCN: Gland, Switzerland, 2014.

9. Gann, G.D.; McDonald, T.; Walder, B.; Aronson, J.; Nelson, C.R.; Jonson, J.; Hallett, J.G.; Eisenberg, C.; Guariguata, M.R.; Liu, J.; et al. International principles and standards for the practice of ecological restoration. Second edition. *Restor. Ecol.* **2019**, *27*, S1–S46. [CrossRef]
10. Brewer, J.; Langston, J.; Ferretti-Gallon, K.; Innes, J.L.; Xin, S.; Zhai, H.; Wang, G. Alleviating forest degradation in the Lancang-Mekong Region requires closing management—measurement gaps. *J. For. Res.* **2020**, *31*, 2033–2051. [CrossRef]
11. Tani, A.; Kanzaki, M.; Ohta, S.; Khorn, S.; Pith, P.; Tith, B.; Ol, S.P.; Lim, S. Principal Forest Types of Three Regions of Cambodia: Kampong Thom, Kratie, and Mondolkiri. In *Forest Environments in the Mekong River Basin*; Springer: Tokyo, Japan, 2007; pp. 201–213.
12. Thomas, I.L. *Drivers of Forest Change in the Greater Mekong Subregion: Laos Country Report*; USAID Lowering Emissions in Asia's Forests: Bangkok, Thailand, 2015.
13. FAO. *The State of the World's Forest Genetic Resources: Country Report: Myanmar*; The Food and Agriculture Organization: Rome, Italy, 2010.
14. FAO. *The State of the World's Forest Genetic Resources: Country Report: Thailand*; Food and Agriculture Organization: Rome, Italy, 2010.
15. Phuong, V.T. Forest Environment of Vietnam: Features of Forest Vegetation and Soils. In *Forest Environments in the Mekong River Basin*; Springer: Tokyo, Japan, 2007; pp. 189–200.
16. Halperin, J.J.; Turner, R.L. *Forest Degradation in Cambodia: An Assessment of Monitoring Options in the Central Cardamom Protected Forest*; United States Forest Service: International Programs: Washington, DC, USA, 2013.
17. Jamroenprucksa, M. *Forest Rehabilitation—Experiences from Thailand*; Keep Asia Green: Vienna, Austria, 2007; p. 183.
18. Thuy, P.T.; Moeliono, M.; Hien, N.T.; Tho, N.H.; Hien, V.T. The context of REDD+ Vietnam: Drivers, agents and institutions. In *CIFOR Occasional Paper*; CIFOR: Jawa Barat, Indonesia, 2012; p. xii-79.
19. Mansourian, S.; Parrotta, J. *Forest Landscape Restoration: Integrated Approaches to Support Effective Implementation*; Routledge: New York, NY, USA, 2020.
20. Boedhihartono, A.K.; Sayer, J. Forest Landscape Resotration: Restoring What and for Whom? In *Forest Landscape Restoration*; Springer: Dordrecht, The Netherlands, 2012; pp. 309–323.
21. Dudley, N.; Baker, C.; Chatterton, P.; Ferwerda, W.; Gutierrez, V.; Madgwick, J. *The 4 Returns Framework for Landscape Restoration*; Commonland, Wetlands, International Landscape finance Lab & IUCN Commission on Ecosystem Management: Amsterdam, The Netherlands, 2021.