CHAPTER

27

# Enhancing multifunctionality through system improvement and landscape democracy processes: a synthesis

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### Highlights

- Landscapes are complex socio-ecological systems with competing land uses and a range of stakeholders with multiple, diverse, and sometimes conflicting objectives
- Multiple tools' processes, often combined in ways that can capture and manage complexity, embrace uncertainty and enable tradeoffs and synergies, are required
- Deliberate attention to process design, implementation and performance can help enhance overall success in implementing a landscape approach
- Democratic/good governance principles, criteria and indicators can help guide and monitor process performance in a landscape approach

## 1. Introduction

The landscape approach has been increasingly featured in the literature as a viable and reliable approach to reconciling agriculture, conservation, development, climate change and other competing land uses and objectives in the context of sustainability (DeFries & Rosenweig, 2010; Scherr et al., 2012; Sayer et al., 2013). At the same time there is growing recognition that landscapes are complex socio-ecological systems with a mosaic of land uses, multiple stakeholders, with diverse and sometimes conflicting objectives and perspectives. Therefore managing landscapes requires an equally sophisticated approach that can work within the complexity involved. However, such sophistication must not stand in the way of sufficiently pragmatic simplicity required to ensure successful implementation. Hence, the question has arisen on how to best facilitate a landscape approach to enable effectiveness, efficiency and equity in practice. This chapter synthesizes cross-cutting process elements from the chapters in this book and proposes a process-based approach to facilitate sustainable multifunctional landscapes in practice. It also draws on the chapters and some of the examples within, as well as broader literature to highlight and demonstrate the relevance and usefulness of process in a landscape approach.

## 2. Processes in landscapes: adaptive management as a guide

Landscapes are place-based systems that result from interactions between people, land, institutions (laws, rules and regulations) and values. They are made up of a mosaic of different land uses with landscape patterns and processes being defined by the interactions occurring between social, ecological and social-ecological systems. A landscape approach can then be defined as a set of concepts, incentives and tools for planning and managing land in order to achieve multiple economic, social and environmental objectives. In the definitions above and in several others, there is less emphasis on a well-defined end product and much more emphasis on interactions, actions, tools, methods and incentives, suggesting that 'process' or 'processes' are perhaps what largely defines a landscape and a landscape approach (see Minang et al., Chapter 1, this book for a more rich description of landscapes and landscape approaches).

As such, major attempts at providing guidelines and principles for landscape approaches have all stressed the importance of process. Several of the ten principles for a landscape approach by Sayer et al. (2013) relate to processes. These include: continual learning and adaptive management, negotiated and transparent logic, participatory and user friendly monitoring, and clarification of rights and responsibilities. Frost et al., (2006) also cite several processes in their guidelines for implementing integrated landscape approaches including: multi-scale analysis and intervention, develop partnerships and engage in action research, facilitate rather than dictate, promote visioning and development of scenarios, and foster social learning and adaptive management. Table 27.1 summarizes how the various chapters in this book address processes in the context of landscape approaches.

One specific concept, which is often directly or indirectly referred to in the process of taking a landscape approach, is adaptive management. Applying an adaptive management framework, or taking an iterative approach, provides the flexibility to adapt management approaches to complex evolving social-ecological systems in the management process itself, to better achieve sustainable outcomes. Adaptive management has been defined as a systematic approach for improving management by learning from system outcomes. It recognizes that resource management in landscapes is dynamic, uncertain and complex, hence continued learning, reflection and adjustments are essential elements for success (Holling, 1978; Lee, 1999). The process typically involves, assessing the problems, considering alternatives, predicting outcomes based on current knowledge, implementing alternatives, gaining new knowledge and using the new knowledge to adjust objectives and options (see Figure 27.1). More broadly, adaptive management is used to refer to processes that allow for learning-by-doing (Plummer 2009). It can also be considered a decision-making process that allows for accountability, transparency and experimentation.

Adaptive management has evolved into adaptive collaborative management (co-management in short; ACM). The co-management dimension captures the idea that rights and responsibilities should be shared among actors that claim any sort of stake in a given resource in the landscape (Plummer, 2009). Hence, ACM can be seen as a multi-stakeholder governance system. One that does not only focus on learning and improvement, but also addresses conflicting interests, values, and actions among multiple actors, and equity. It can therefore be seen to have several similarities with the emerging concept of landscape democracy elucidated in Box 27.1.

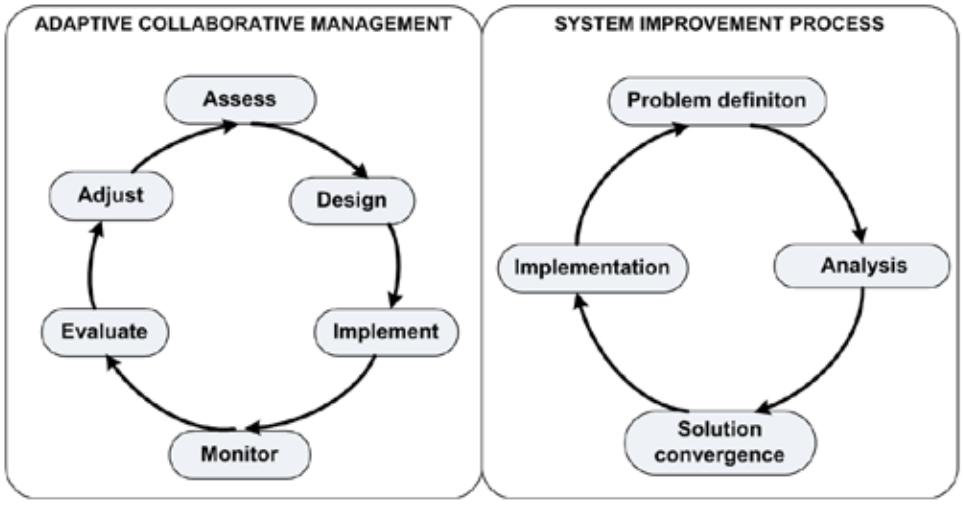


**Figure 27.1** An illustration showing both adaptive collaborative management (ACM) and system improvement process (SIP).

Plummer (2009) identifies key determinants of outcomes in ACM. Among the endogenous factors are: properties of networks (i.e., connectivity, centrality), assets employed by agencies, institutions and individuals (i.e., human, social, physical, financial and natural capitals), and key features of individuals and attributes of organizations (e.g., leadership, emotions, capacity, knowledge systems, power, culture, etc.). Among exogenous factors are: social and political contexts, meso-scale drivers of change, and ecosystem changes and resource alterations that perpetuate crisis.

While ACM has been well developed theoretically, implementation has been more challenging, often simplified into a learning-by-doing scenario and less structured to sufficiently handle complexity, uncertainty and feedbacks. Below is a summary of some of the challenges that are encountered in practice:

1. **Transition from process to results:** Adaptive management usually involves long-time frames, implying long waits for results (Jones, 2009). Jiggins and Röling (2002) raised this concern in the context of applying adaptive management to forest management.
2. **Cross-scale problems:** In adaptive management, it is often difficult to prove if the desired changes at the micro-level could actually lead to changes at the macro-level (Jiggins & Röling, 2002; Walters, 1997).
3. **Boundary problems:** Adaptive management is only possible within a defined system boundary. However, there is no objective way of delineating boundaries for social-ecological systems.
4. **High costs of monitoring** (Walters, 1997; Lee, 1999; Jones, 2009)**:** Adaptive management involves monitoring changes over a long period of time (Lee, 1999) and over a large-scale area involving very complex processes and usually significant financial commitments.
5. **Vulnerability to institutional changes:** Institutions are often changing and the long-term nature in adaptive management renders the process vulnerable to such changes (Jones, 2009).

The challenges above can be summarized into two main issues. Firstly, the lack of sufficient understanding and deployment of structured analysis across both spatial and temporal scales (see Minang et al., Chapter 9, this book); and secondly, challenges with facilitating collaborative processes. In the remainder of the chapter, we focus on options for addressing these two challenges in a bid to improve ACM processes within landscapes.

# 3. A systems improvement process approach

Regarding the first challenge on structuring analysis in landscapes, several potential approaches exist. In looking for one that brings in fundamental change, we identified among others, the Systems Improvement Process (SIP). SIP is a comprehensive analytical framework for solving difficult large-scale social system problems such as sustainability (Harich & Bangerter, 2014). The process centres on root cause analysis, and uses problem decomposition and feedback loop modelling to find and resolve the root causes. This is justified by the fact that the problems addressed in landscapes are 'wicked' and therefore need to be properly analysed and tackled from the roots. Decomposition potentially helps improve understanding of complex issues while modelling helps learning about potential solutions (Checkland, 2000). SIP consists of five main steps: problem definition, analysis, solution convergence, implementation and continuous improvement. Each step has further sub-sets of steps. Figure 27.1 shows the details of each of the steps, but more significantly it shows that the difference between SIP and ACM is the emphasis on analysis of the problem and solutions. SIP suggests that 80% of the time spent in sorting out complex socio-ecological challenges should be spent on problem analysis in a participatory mode in order to identify and build solutions to root causes.

Finding root causes of a problem and looking extensively at high leverage points in the feedback loops should be dominant in resolving the problem (see Duguma & Minang, Chapter 10, this book for details on leveraging systems). At the solution convergence stage, the options are narrowed down to solutions that can work around 'high leverage points', which are then tested. Bringing such structured problem analysis and solution identification into ACM processes could potentially improve sustainable landscape management processes.

# 4. A process structure

Figure 27.2 summarizes a process framework (referred to as the 'Landscape Process Wheel') that borrows from adaptive management, enhanced with landscape democracy/ governance (Arler, 2011; Colfer & Pfund, 2011) and SIP. It consists of five main components, namely: planning; actions and practices; policies, institutions and capacity; monitoring, evaluation and audit; and participation and negotiations. Beyond the generic adaptive management process cycle of plan, act, monitor, evaluate, and plan, specific emphasis has been put here on practices, policies, institutions, capacity and participation and negotiations because they have emerged in recent years as challenges in successful sustainable landscape management (Fisher et al., 2007; Plummer, 2009). Suffices to mention that in reality the process components mentioned herein above are interlinked and are scarcely linear. We present them here in components for purposes of understanding. The sub-components in the framework are intended as guidance and not by any means exhaustive.

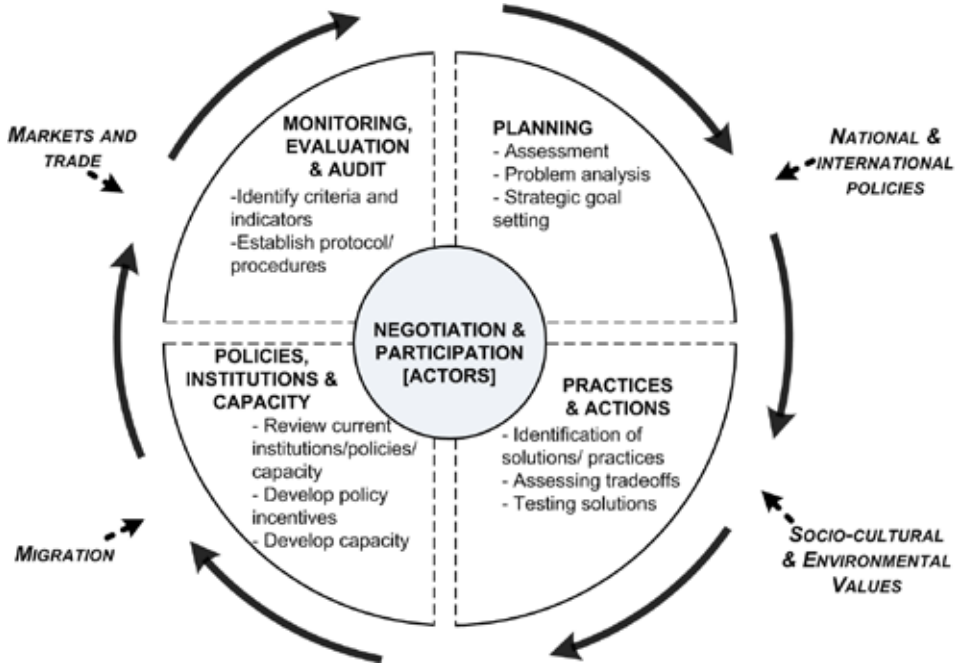


**Figure 27.2** The Landscape Process Wheel showing main landscape processes. Text in italics with broken arrows represents the landscape context and external driving forces.

Table 27.1 summarizes how the chapters in this volume address each of these processes. By positioning negotiation and participation as core elements in an ACM process enhanced by SIP, it is our hope that this could potentially address the problem structuring and facilitation challenges of classic ACM identified earlier on in this chapter.

## 4.1 Planning

Planning processes in landscapes are well documented in the literature (Dalal-Clayton et al., 2003). In generic terms, these processes involve setting out desired goals and a course of action to develop the landscape. Typically such a process will involve identifying the main problems/challenges, analyzing the challenges, identifying solutions and charting course for implementation. The aspect of disaggregated problem (root cause) analysis as a means of improvement through process improvement (Harich & Bangerter, 2014) and leveraging systems in landscapes (as discussed in Duguma & Minang, Chapter 10) can be key parts of this process. Chapters 15 (Villamor et al.), 16 (Suyanto et al.) and 17 (Dewi et al.) of this book offer models for planning across multiple sectors within the context of climate change, and providing tools to identify options within and across different sectors in the landscape (e.g., agriculture, forestry, etc.). Villamor et al. (Chapter 15) specifically looks at the benefits and advantages of using tools for gender-specific spatial analysis while Suyanto et al. (Chapter 16) and Dewi et al. (Chapter 17) focus on identifying low-emission development pathways across sectors. Alternatively, Bernard (Chapters 4) and Louman et al. (Chapter 6) draw on other specific landscape approach planning and management processes looking to experiences of the '*gestion de terroirs*' concept applied in Francophone West Africa, and 'Climate Smart Territories' in Central America, respectively.

Table 27.1 Summary of how chapters in this book address various dimensions of landscape processes.

| Process component/sub-component | Book chapter and contribution |
|---|---|
| *Planning*<br>• Assessment<br>• Problem analysis<br>• Strategic goal setting | Chapter 2: Defing and understanding the landscape<br>Chapter 9: Scale considerations in landscape analysis<br>Chapter 10: Leveraging systems as an approach to seeking solutions in landscapes<br>Chapter 13: Dealing with multiple knowledge systems<br>Chapter 15: Gender analysis tools/scenario analysis<br>Chapters 16 and 17: Tools for analyzing options<br>Chapters 4, 6, 22: Examples or case studies of planning |
| *Actions and practice*<br>• Identifying appropriate solutions/ practices<br>• Assessing tradeoffs and synergies between practices/solutions<br>• Testing solutions | Chapter 3: Seeking multifunctionality through synergies and reducing tradeoffs<br>Chapter 5: Socio-ecological systems approach to analyzing and addressing landscape restoration<br>Chapters 13 and 14: Specific actions for charcoal and water<br>Chapters 16 and 17: Tools for analyzing options<br>Chapters 12 and 23: Scenario analysis of options<br>Chapter 22: An assessment tool to identify needs and opportunities for climate-smart agriculture within the landscape |
| *Institutions/policies/knowledge*<br>• Review institutions/policies and capacity (knowledge, skills and attitudes)<br>• Develop policy incentives<br>• Develop capacity | Chapter 13: Multiple governance instruments<br>Chapter 18: Identify and discuss a set of key elements for institutional arrangements for climate-smart landscapes<br>Chapter 23: Shows how institutional change pathways and processes directly impact community forest landscapes in Cameroon<br>Chapters 19, 20, 21: Identify opportunities for the private sector as an institution to invest in landscapes and adopt landscape approaches |
| *Monitoring, evaluation and audit*<br>• Identify criteria and indicators<br>• Establish protocol/ procedures<br>• Verification and audit | Chapter 5: Socio-ecological systems indicators<br>Chapter 8: Link to the Sustainable Development Goals (SDGs) and the associated monitoring framework that will be set up<br>Chapter 13: Proposed buffering indicator<br>Chapter 15: Gender analysis tools/scenario analysis<br>Chapters 16 and 17: Tools for analyzing options |

| | |
|---|---|
| *Negotiation and participation* | Chapter 9: Scale considerations in the facilitation of landscape processes<br>Chapter 13: Introduces a set of tools for evidence-based negotiation support in landscapes approaches<br>Chapter 17: Elaborates on a set of tools for negotiating multiple issues in ecosystem services and emission reductions and provides case studies<br>Chapters 4, 6, 7, 11, 13, 17, 18, 24, 25: All give examples of participatory landscape processes involving negotiations |

## 4.2 Actions and practices

Ensuring that actions taken are effective and efficient is an important element of successful sustainable landscapes. This begins with identification and selection of appropriate practices in the specific landscape context. Sutherland et al. (2011) propose an interesting solution scanning approach for selection management intervention applicable to landscapes. Several multi-criteria tools exist for evaluating and selecting land management practices (Coe et al., 2014). In this book a number of chapters present tools and examples for enhancing actions in landscapes. Focusing on intensification, the socio-ecological systems approach for analyzing and addressing landscape restoration (Duguma et al., Chapter 5) and scenarios for assessing options for sustainable intensification in landscapes (Öborn et al., Chapter 12; Alemagi et al., Chapter 24) provide some insights on how to sustainably apply this at the landscape scale.

Analysing tradeoffs and synergies between actions is extremely important at the landscape level (Freeman, Chapter 3). Therefore, understanding tradeoffs and forging synergy for landscape actions are key processes in taking a landscape approach. Testing options and adapting practices is an important part of the process, in order to discern what works in a given landscape. This requires the participation of a range of different knowledgeable actors within in the landscape.

## 4.3 Policies, institutions and capacity

Inadequacies in institutions, capacity development and policies are often cited as factors responsible for either the failure or success of landscape initiatives (Martson, 2000). We therefore consider these as important determining elements in landscape processes. Institutions and policies provide the set of values, rules and regulations for engagement and management of landscapes, and hence, are crucial for landscape management. Capacity includes knowledge, skills and resources needed for effective and efficient management of landscapes. A key ingredient here relates to the identification and deployment of traditional and local knowledge alongside scientific knowledge in the context of adaptive management (Berkes et al., 2000).

Wambugu et al. (Chapter 18) identify and discuss a set of key elements for institutional arrangements for climate-smart landscapes. Focusing on community forest landscapes in Cameroon, Foundjem-Tita et al. (Chapter 23) shows how institutional change pathways and processes directly impact the outcome of such community-based initiatives providing some lessons learned. Kissinger et al. (Chapter 19), Gyau et al. (Chapter 20) and Namirembe and Bernard (Chapter 21), specifically focus on the role of the private sector - as one kind of institution - in landscape approaches and opportunities for their engagement.

### 4.4 Monitoring, evaluation and audit

Monitoring, evaluation and audit are essential processes that provide the basis for reflective learning in landscapes. It is meant to provide observations on progress towards the agreed objectives and actions in the landscape. Clear, agreed and practical indicators for measuring progress are needed, and roles and responsibilities in measuring, analyzing, verifying and recording are crucial. Several authors have emphasized the role of participatory monitoring and evaluation processes that may be as effective and efficient as scientific monitoring (Zahabu, 2006; Brofeldt et al., 2014), but having the advantage of local ownership, added legitimacy and potentially a better chance to use the results to change behaviour in landscapes (Alcorn, 2000). van Noordwijk et al. (Chapter 13) discusses the concept of buffering indicators in landscapes.

### 4.5 Negotiation and participation

Negotiation is extremely important in arriving at common goals, objectives and sustainable solutions in landscapes. It is one way through which the important element of trust can be generated in multi-stakeholder landscapes. A negotiation process that can bring about trust among actors has to be transparent, fair, equitable and accountable (Caddy & Vergez, 2001). The participation of all stakeholders in decision-making is a necessary pre-condition for such a transparent and accountable process (Arnstein, 1969).

Dewi et al. (Chapter 17) elaborates on a set of tools for negotiating multiple objectives related to ecosystem services and emission reductions and provides case studies of how they are applied in Indonesia. Table 13.2, in Chapter 13 (van Noordwijk et al.), introduces a set of tools for evidence-based negotiation support in landscapes approaches.

Legitimacy demands the participation of all stakeholders in all processes and decision-making, executed in a fair and equitable manner. Sufficient attention has to be paid to women, youth, minorities and disadvantaged groups in the landscape community. Participation can be defined by various types and intensities from lowest to highest: manipulative and passive (information flows between local people and outsiders); consultation and functional participation (facilitators refer focused and specific issues to local people and interpret their responses into a pre-prepared frame); interactive involvement in decision-making by actors in most stages; and initiating actions 'from' and 'owned' by local people (see ladders of participation by Arnstein, 1969; Catley, 1999; Carver, 2003). Chapters 4 (Bernard), 6 (Louman et al.), 11 (Catacutan et al.), 15 (Villamor et al.,) and 18 (Wambugu et al.) all emphasize and provide examples of participatory processes.

This component of processes in a landscape approach is the hub around which the success of all other processes depend. Elements of participation and negotiation are needed for decision-making in all process components.

## 5. Landscape democracy: a platform for improving processes

We have established in the preceding sections that successful landscape approaches are best facilitated as multi-stakeholder processes, in which ACM is enhanced through systems improvement. Striving to maintain a quality process therefore requires guiding principles and frameworks for monitoring. Democratic or good governance principles,

Box 27.1

## Landscape Democracy

Landscape democracy can be defined as the operationalization of democratic and good governance principles (such as transparency, accountability, participation, legitimacy and coordination) in multi-stakeholder processes at the landscape level. Landscapes are multi-stakeholder spaces, often characterized by diverse perspectives, interests and goals. More often than not these interests and goals are conflicting, requiring participatory and highly interactive decision-making processes to bring about sustainable landscapes. This raises questions as to who should make decisions in landscapes and how and why those decisions should be made - hence, the link between democracy and landscapes and the term 'landscape democracy'. Landscape governance can thus be seen as a set of measures of the relationships between the 'governed', i.e., civil society and the public, and the 'governing', i.e., government, its institutions and private sector interests (UNDP, 1997; Caddy & Vergez, 2001).

The European Landscape Convention sees landscape development "... as the concern of all and lends itself to democratic treatment, particularly at the local and regional levels. Landscape democracy has also been seen as an extension of Aldo's Land Ethic (Matrazzo, 2013). Aldo's Land Ethic enlarges the 'community' to include soils, waters, plants and animals or collectively 'the land'. This implies that restoration of sustainable landscapes and the connection between rights and responsibilities and 'land' must be established.

Arler (2011), identifies and discusses relevant values that landscape democracy could build: self-determination (autonomy in decision-making); co-determination and participation (ensuring common good); impartiality and respect for arguments (ensuring deliberation and that well considered decisions are made); and procedures and multi-order impartiality (rules for deliberation that ensure respect and equity). The extent to which these values prevail in landscapes would depend on degrees of centralization, decentralization, and devolution in the country. The principle of subsidiarity in the European Union is a good example on which the concept of landscape democracy has been based. Levels at which decisions can be made in each country can influence sustainable development in landscapes (Colfer et al., 2011). Nonetheless, these values remain important determinants of successful landscape processes.

criteria and indicators have been deployed in participatory process quality assessment and monitoring in natural resource management (Alcorn, 2000; McCall & Minang, 2005). In a critical review of ACM, Prabhu et al. (2007) identify three anchors for success namely, communication and creation of a vision, social learning and joint collective. These anchors dovetail with democratic principles, hence suggesting that landscape democracy is a potential pathway for improving effectiveness and efficiency in landscapes. Box 27.1 introduces the concept of landscape democracy.

We introduce a set of good governance and landscape democracy-based dimensions, criteria and indicators for monitoring and designing landscapes to ensure effectiveness, efficiency and equity. Key dimensions include legitimacy and participation, empowerment, ownership of knowledge and process, respect for local people and indigenous local knowledge, equity and effectiveness and competence. These dimensions are further broken down into criteria and specific indicators for tracking landscape processes (see Figure 27.3 for details). The suggested criteria and indicators set in Figure 27.3 are not intended to be exhaustive, but a guide that is modifiable in different contexts. We

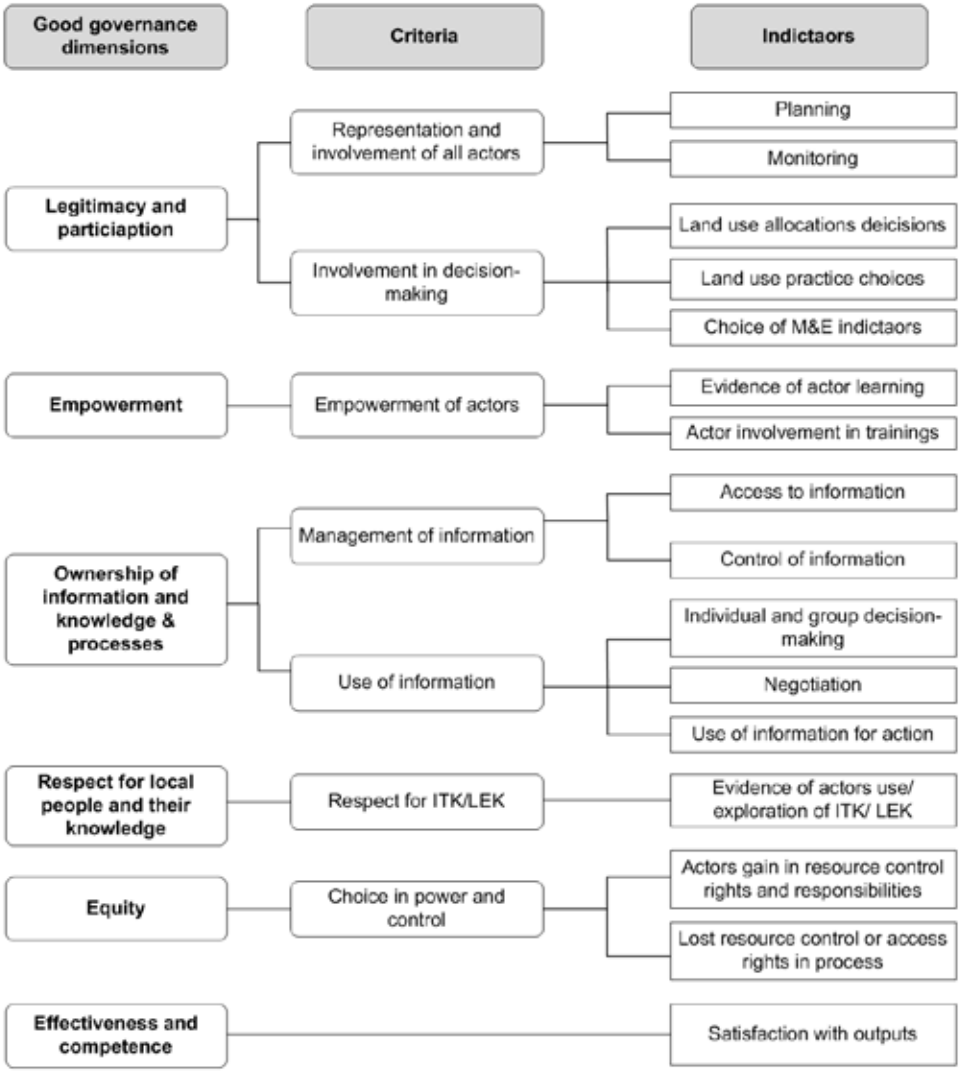


Figure 27.3 A suggested good governance framework for assessing landscape negotiation processes. ITK denotes Indigenous Technical Knowledge, while LEK represents Local Ecological Knowledge. Source: adapted from McCall and Minang (2005).

briefly elucidate on the dimensions in the ensuing text. The legitimacy and participation dimension has already been discussed in the preceding section.

**Empowerment:** Empowerment is largely derived from the purpose of the agency facilitating the process. This can be seen as a continuum. At one end is 'facilitation'- when participation is used to introduce or endorse an outside agenda - while the other end is 'empowerment' - wherein participation is intended to enhance local decision-making, reinforce responsibilities and amplify the voice of local people (McCall & Minang, 2005). At any point in-between is 'mediation', where the aim is to enable tradeoffs between

multiple interests and objectives. These purposes of participation, facilitation, mediation and empowerment (McCall, 2003) are important to keep in mind and look out for in any landscape approach.

**Ownership of knowledge and process:** Who owns? Who manages? And who has access to what information is an important power variable in participatory decision-making processes. Similarly who controls the process is also important. Having a transparent and open process and giving a voice to each actor is important. These are critical variables of trust not only in terms of decision-making processes but also for eventual implementation.

**Respect for local people and indigenous/local knowledge:** Local knowledge (both technical and general) is important for two reasons. It can be a measure of community capability to make a difference in landscapes, and is complementary to scientific knowledge. Berkes et al. (2000) found that traditional ecological knowledge constituted in many cases a wealth of knowledge that allowed interpretation and responding to feedback to guide resource management with similarities to adaptive management in terms of feedback learning, and the treatment of uncertainty/unpredictability. Making this part of the analytical, implementation and learning processes in landscapes would be beneficial.

**Equity:** Landscape processes can impact stakeholders negatively and positively. Being sensitive to stakeholder needs and vulnerabilities and to the power relations between actors in a landscape is extremely useful in landscape processes. As we saw in the facilitating, mediating and/or empowerment dimensions of participation, it is important to monitor the impact and/or potential impacts on actor perceptions, and interests. Gender has emerged as an important dimension to watch in landscape processes (Villamor et al., 2014). It is also important to address the merging specificities of the private sector and any other group needing attention.

**Effectiveness and competence:** Participatory processes can be quite demanding in terms of time, resources and technical know-how. While accepting uncertainty and risks is expected in an adaptive management process, managing both is not quite easy. These technical and logistical challenges of collaborative stakeholder processes need to be managed in the process as best possible if the expected outcome is to be reached. One way of doing this is to check satisfaction with intermediary outputs and outcomes in the process. Satisfaction with the process and outputs will be the ultimate measure of success.

# 6. Reflections and way forward

We set out in this book to review experiences and present a set of concepts, tools, methods and incentives that can help professionals, researchers and policymakers better understand and improve landscape approaches. In our journey we have examined four propositions. Firstly, that the current configuration of landscapes is usually far from the potential (Proposition A), that landscape approaches can aim for broader perspectives on multifunctionality than is reflected in the business-as-usual trajectory (Proposition B), that climate change is a small (but important) part of a wider set of necessary landscape functions (Proposition C), and that theories of change need to build on theories of place, for context specific blending of fairness and efficiency.

This chapter sought to explore opportunities for improving multi-stakeholder processes, based on learning from the 25 chapters in this book (Parts 1-5). We found ACM, SIP

and landscape democracy as potential building blocks for such an improvement process going forward. However, some salient points for reflection remain. We frame them under two practical implementation perspectives: landscape analysis and understanding and facilitation of actions in landscapes.

## 6.1 On landscape analysis

Landscapes are complex multi-level systems with multiple components and multiple interactions. As dynamic systems, landscapes are also uncertain and unpredictable therefore embracing uncertainty and capturing complexity in a dynamic way remains an important challenge for working in landscapes. A number of points need to be kept in mind as we take the journey into landscape approaches.

### Between 'sophistication' and 'practicality':

This book has assembled and introduced several concepts, tools, methods and incentives for analysing and inducing change in landscapes. There are choice challenges as multiple tools should be combined in ways sophisticated enough to capture and manage complexity, embrace uncertainty and enables tradeoffs and synergies. At the same time such sophistication must not stand in the way of sufficiently pragmatic simplicity required to ensure successful implementation. This dilemma needs further guidance and attention. Clearly tradeoffs exist between increased accuracy and possibilities for local participation, local involvement and local knowledge; integration guidance is needed with respect to tools, methods, and options selection by context (Coe et al., 2014), but also skills and knowledge requirements in the use of the tools.

### Between 'precision' and 'accuracy':

How much precision (reproducibility of results under the same conditions) is required? For whom? and for what purposes? are important questions for consideration in landscapes. The implications of sampling size and data requirements for improved accuracy (closeness to real value) and the associated costs represent serious considerations in landscape analysis. For outside certification processes, it might be unnecessary to invest so much when returns on investment may not be as high. This is critical for carbon projects. At current carbon prices of between 2-5 USD per ton in developing countries conservative estimates may be reasonable unless in exceptional circumstances. Spatially aggregating to a 1 $km^2$ assessment size may reduce uncertainty to an acceptable level with low-cost assessment methods (Lusiana et al., 2014). The main consideration here should be the purpose(s) of the landscape action, and a match of scales for monitoring and action.

### Principles of scale:

Scale is a key determinant in understanding, planning and managing landscapes. Stakeholders in a landscape may perceive the landscape and its functioning differently, given their specific interests. Therefore, in seeking to answer the question, what is/are the appropriate scale(s) for analyzing a phenomenon, three pre-requisite considerations might be important. These include: i) *'hierarchy in scale'*- the extent to which phenomena manifest at multiple scales and/or are hierarchical in structure; ii) *'scale effects'*- what changes in patterns and processes can be observed when the scale of analysis changes; and iii) *'scaling'*- what theories, methods and models can be used in extrapolating/translating information across scales? The scale of analysis can be determined by the observer using appropriate criteria and analytical methods (Turner et al., 1989). While several studies

exist, there is no consensus on characteristic scales and hierarchical levels for several phenomena (Wu & Qi, 2000). Hence, specific attention and justification is needed for any robust analysis of multifunctional landscapes. Combining the technical understanding of scale with the multiple knowledge systems provides a further challenge.

### Metrics for function and process:

One of the most challenging aspects of landscape approaches is the question of metrics for determining multifunctionality or sustainability and metrics for effective, efficient and equitable landscape processes. In this chapter, we have attempted to provide a set of good governance criteria and indicators for process performance assessment, but these are largely qualitative, though quantifiable. Some work is needed to further quantify these dimensions.

There have been attempts at metrics for sustainability in landscapes (Cassatello & Peano, 2011) in a European context and several attempts at sustainable forest landscapes and land management in developing countries (Dumanski, 1997; Sheil et al., 2004) but attempts at metrics that capture systems dimensions of landscapes and are cost effective are still elusive (Torquebieau et al., 2013). Bernard et al. (2014) argued that unsustainability issues are easier to identify than a firm statement of sustainability. Landscapes may represent the appropriate and practical scale at which national and global objectives related to a green economy, the SDGs and/or natural capital accounting can be monitored (See Mbow et al., Chapter 8, on opportunities for linking SDGs with landscapes). This represents an important area of research in the immediate and medium term.

## 6.2 On facilitating and enabling action

Several chapters in this volume have highlighted the importance of participatory processes in bringing about change in landscapes (Chapters 4, 6, 7, 11, 13, 17 and 18). One major opportunity in landscapes approaches is the potential for harmonising often divergent sectoral policies and activities at the landscape scale through participatory processes especially between agriculture, forestry, environment, mining, livestock, fisheries and others. Still a number of critical issues stand out from these chapters and in the literature.

### Synergy and tradeoffs:

Every landscape approach will have multiple actors, with diverse and often conflicting objectives (e.g., conservation versus competing agriculture, emission reductions, biofuel production and many more; see Torquebiau, Chapter 2). It is therefore important to understand the tradeoffs in reconciling these objectives in landscape implementation processes (see Freeman, Chapter 3). Recognizing the interests and actors and how they might negotiate is important. However, understanding potential synergies between objectives and interests can be more helpful. Further development of evidence-based negotiations and planning landscapes (including the methods and capacity for implementation) will remain a crucial area of work in developing countries.

Understanding opportunity costs of various land use options and the ecological productivity thresholds for various options and their impacts are good examples of tradeoff considerations needed for decision-making or negotiations. One way forward identified and needing further research for synergy in climate-smart landscapes is a ‘land use practice portfolio approach to synergy’ (Harvey et al., 2013; Duguma et al. 2014) as one way of bringing together climate change mitigation and adaptation strategies

and the multiple mechanisms involved (e.g., Clean Development Mechanism, REDD+, Nationally Appropriate Mitigation Actions (NAMAs) and others) at the landscape level.

## Business case for landscapes:

The exploratory analysis of public-private interactions in the context of landscapes in Part 4 of this book (Kissinger et al., Gyau et al., Namirembe and Bernard, Chapters 19, 20, 21) reveals a number of key issues such as lack of necessary policy conditions, frameworks and capacity to engage the private sector on the part of communities. A leading factor in the later category is the absence of a business case approach to landscapes, hence insufficient investments in landscapes. So far market infrastructure for carbon and water services have remained very poorly developed and other services such as biodiversity are lacking clear mechanisms through which public and private actors can co-invest (van Noordwijk et al., 2012). Such a co-investment framework is necessary for any successful and viable multifunctional landscape approach in the future hence substantial research investments are needed.

## Nested landscapes:

In most of the landscapes presented in this book and elsewhere, multifunctionality or sustainability has been sought within landscapes. Increasingly, with concepts such as reduced emissions in the case of REDD+ or NAMAs wherein accountability is at the national level, there is a need to nest landscapes to national level policies and actions such as towards a green economy or the SDGs (Minang & van Noordwijk, 2013). Given that drivers of landscapes are largely from outside landscapes, e.g., markets, migration etc. (see Figure 27.2), landscapes may need to work with adjacent landscapes if problems of leakage (displacement of activities due to local actions) are to be handled. More so, there are questions as to the degree to which landscapes can specialize in given functions as long as they can 'outsource' other functions to adjacent, distant or associated landscapes. To what degree should a landscape develop cash crops (e.g., rubber, cocoa, oil palm) as long as they can import food from another landscape? Maybe this is possible if there is some jurisdictional planning at a level where several landscapes interact. These sorts of nesting related questions need to be answered if landscape approaches are to contribute meaningfully to sustainable development.

In summary, for current landscapes to move towards the full potential of multifunctionality, fully involving all interested parties in defining an agreed vision for change, and taking into account climate change among multiple boundary conditions, tremendous attention needs to be given to improving processes in term of analysis (especially in terms of structuring wicked problems) and decision-making. This book has made some contributions by exploring concepts, tools, incentives and experiences, but much more is needed going forward. Some of the concepts highlighted such as landscape democracy, systems improvement, nesting landscapes and others need further testing within climate-smart landscapes and multifunctional landscapes in general.

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