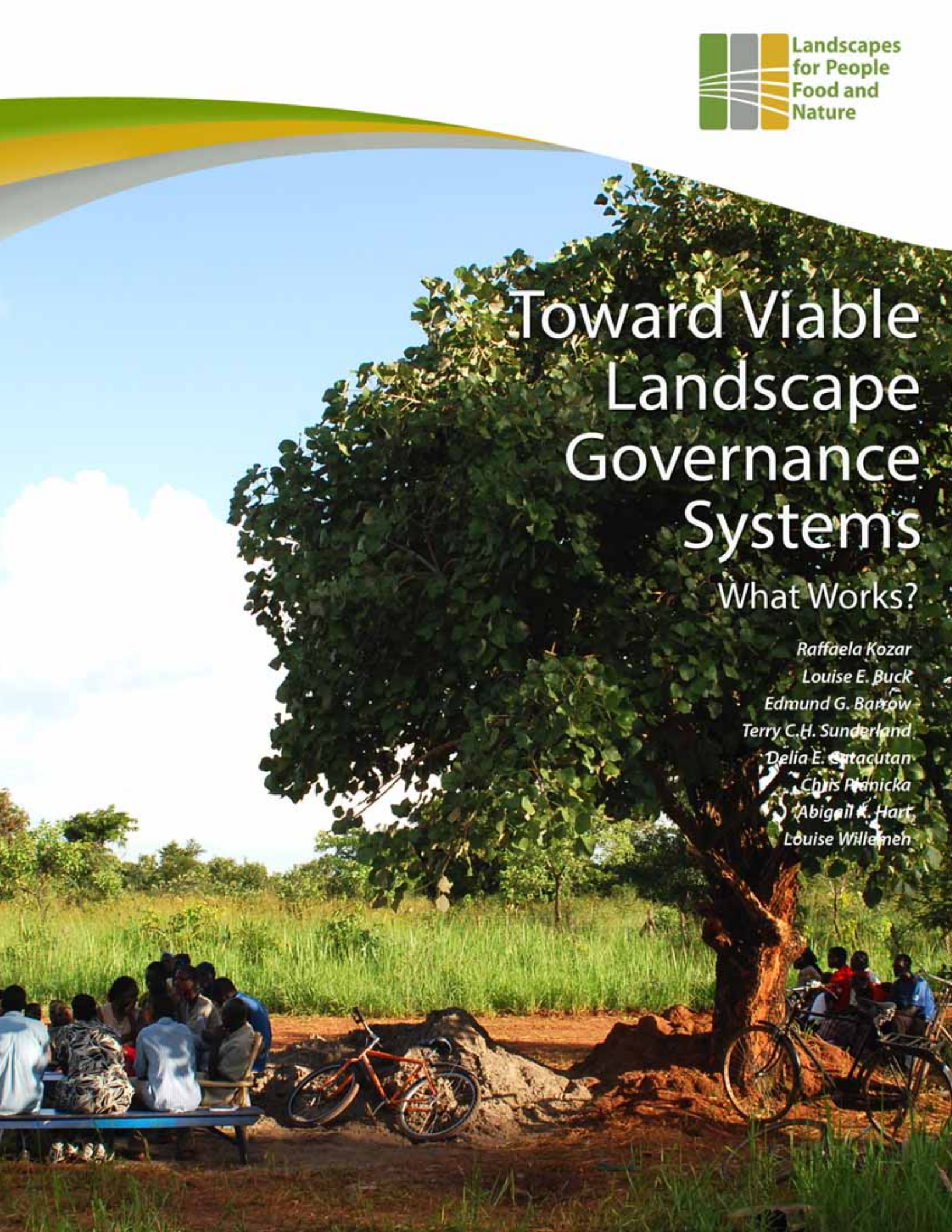
Landscapes for People Food and Nature



Toward Viable Landscape Governance Systems

What Works?

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Community leaders gather in Gulu, Uganda. Photo courtesy of Lee Gross, EcoAgriculture Partners.

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Find out more at:
www.landscapes.ecoagriculture.org

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The framing of this paper was informed by partners of the Landscapes for People, Food and Nature (LPFN) Initiative. The working paper is a knowledge product of the LPFN Global Review, which draws on the expertise of leading practitioners, researchers, and experts to document and communicate key dimensions of the practice, impact, potential, and mechanisms supporting integrated landscape approaches. Its preparation was coordinated by the LPFN Working Group on Landscape Strengthening.

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Acronyms

AM	Adaptive management
CFM	Community forestry and forest management
CBD	Convention on Biodiversity
CBNRM	Community-based natural resources management
CIFOR	Center for International Forestry Research
CSOs	Civil society organizations
EU	European Union
FAO	Food and Agriculture Organization of the United Nations
FESP	Forest and Environment Sector Program
FFS	Farmer field schools
GEF	Global Environment Facility
GLF	Global Landscape Forum
ICRAF	World Agroforestry Centre
ILM	Integrated landscape management
ILRF	Integrated Landscapes Research Forum, held at Cornell University, October 10, 2013
IUCN	International Union for Conservation of Nature
IWRM	Integrated water resources management
Kagera TAMP	Transboundary Agro-ecosystem Management Programme for the Kagera River Basin
LLEBM	Landscape-level ecosystem-based management
LPFN	Landscapes for People, Food and Nature initiative
LUP	Land use planning
MDG	Millennium Development Goals
NTFP	Non-timber forest products
PES	Payments for ecosystem services
PNTD	Participatory negotiated territorial development
PVA	Participatory vulnerability assessments
REDD/ REDD+	Reducing Emissions from Deforestation and Forest Degradation
RNP	Swiss Regional Nature Parks
RTRS	Roundtable on Responsible Soy
SLM	Sustainable land management
TOU	Technical Operations Unit system in Cameroon
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNFCCC COP 19	Conference of the Parties to the United Nations Framework Convention on Climate Change 19 – held in Warsaw, Poland, from November 16-17, 2013

Executive Summary

"As global and local stakeholders increasingly seek a wide range of qualities and benefits from landscapes, the divergent values and interests of multiple types of actors at different levels creates new challenges for governance."

'Landscape' is a construct that helps improve the linkages between people and nature. As global and local stakeholders increasingly seek a wide range of qualities and benefits from landscapes, the divergent values and interests of multiple types of actors at different levels creates new challenges for governance. Inhabitants of landscapes and other practitioners are experimenting with the scaling-up of landscape approaches from diverse entry points. What emerges from this process of innovation raises a set of institutional issues concerning multi-level and multi-actor governance that pose an imminent challenge to successfully realizing multiple outcomes from landscapes.

Governance, in the context of multifunctional landscapes, is needed to reconcile among diverse actors what functions will be located where, and the rules that determine who has rights and benefits to what resources at what time, as well as ways to enforce those rules. Governance processes have also to answer the fundamental question of who decides such questions based on what values, and who is included and excluded from activities and benefits linked to different functions within the management of complex landscapes.

Landscape governance is thereby concerned with the institutional arrangements, decision-making processes, policy instruments and underlying values in the system by which multiple actors pursue their interests in sustainable food production, biodiversity and ecosystem service conservation and livelihood security in multifunctional landscapes. While much has been learned by landscape inhabitants' management practices over many decades, and practitioners are generating a great deal of experience with governance issues for landscapes, there has been relatively little socializing of the knowledge that has been gained. Hence, knowledge gaps constrain the further development of landscape governance systems.

In response to the increasing recognition of complex problems that go beyond a single issue, practitioners are experimenting with approaches that go beyond traditional sectors and embrace strategies with multiple objectives and outcomes to get the full range of desired goods and services from landscapes. These approaches often contribute to or comprise management systems that integrate food security, agriculture, ecosystem conservation, human well-being and other values at a landscape scale. We introduce these approaches as analogous management systems to integrated landscape management.

This working paper is built around the experience of landscape actors, practitioners and the researchers who study and support them by bringing forth evidence about the challenges they face, their strategies and their successes working in diverse communities of practice that encompass multiple analogous management systems. These experiences are drawn from the proceedings of a panel discussion on landscape governance that was conducted at the Global Landscape Forum (GLF), a side event of the Conference of the Parties to the United Nations Framework Convention on Climate Change (UNFCCC COP 19) held in Warsaw, Poland in November, 2013.

The collection of innovations, lessons and emerging good practice in analogous management systems forms a basis for identifying the practical elements needed to help guide the growing community of landscape leaders and practitioners to co-design effective landscape governance systems. Principles, decision-making processes, institutional arrangements, integration mechanisms, and knowledge systems are derived to inform a view of "what works" in co-designing viable landscape governance systems.

Analysis of the rich body of evidence demonstrates that ways in which issues of scale and multi-actor governance are conceptualized and the manner in which solutions for viable governance systems are designed, is emergent and variant. Prominent challenges that landscape actors grapple with to put into practice landscape governance systems that account for multiple actors, levels, scales and sectors are negotiating what and whose landscape is being governed, reconciling social and ecological boundaries and scales, resolving governance options and metrics of evaluation, and balancing power dynamics.

To address these challenges, landscape governance systems should value the interests of multiple actors. Strategies for constructing landscape specific knowledges that acknowledge, reconcile, translate and co-create multiple perspectives are essential in managing the functions and realizing the performance outcomes of the landscape. The complexity in landscape governance calls for a negotiation-support system where diverse knowledge systems are understood by all involved, and solutions are created in a cooperative manner. Dynamic innovation systems that foster social learning and communication can nurture such knowledge systems.

Governance arrangements at a single level will not sustain multiple outcomes nor reflect diverse values of actors inside and outside of the landscape. Robust institutions capable of traversing scales and levels are needed to provide the mechanisms and incentives by which actors can cooperate to realize their desired outcomes.

No particular multi-scale governance arrangement appears to constitute a more favorable structure for landscape governance systems than others. While a variety of different landscape governance arrangements are viable, the design of landscape governance systems should emphasize configurations that promote innovation and learning among actors through flexible arrangements, and fit with the location-specific characteristics of the landscape. Promising institutional arrangements include networked and deliberative arrangements, vertical integration through, for instance, nested institutional arrangements, and multi-level boundary and bridging organizations.

Governance arrangements need not be based at the local or regional level as is often suggested. It is essential however, to ensure local governments are adequately considered in design schemata for landscape governance systems. Landscape actors will need to consider how customary governance arrange-

ments may be adapted in designs that consider the changing ecological and social scales brought about by new demands and new actors engaged with the landscape from multiple levels.

Finding coherence and complementarity among roles and functions of state and non-state actors is essential. This exploration of landscape governance demonstrates that public authorities at multiple levels are influential institutional actors, and that private and civic sector actors are influential as well. It follows that good policy for landscape governance will stem from multiple sources of authority and ingenuity. Practitioners are challenged to explore more ways within whole landscape governance systems to create 'generative forms' of power that pull actors together through collective action, and avoid designing systems that allow influential interests or power imbalances to prevail. Regulatory mechanisms in landscape governance systems must help to ensure the cross-sectoral, multi-stakeholder cooperation and benefit distribution that is needed.

Collaborative frameworks can support landscape policy and practice through the actions of key individuals and champions, while helping to overcome divergent values and interests, institutional hurdles and resource limitations. Multi-sectoral cooperation frameworks can be useful in linking levels from the local to the global, and promoting horizontal and vertical integration that is inclusive of diverse forms of knowledge across the science-policy-practice continuum. They provide an especially useful role in establishing an enabling environment for further multi-sectoral work on developing principles and guidelines that can underpin landscape governance systems.

Investment in building a critical mass of agents with the capacities needed for landscape governance should be directed at strengthening collaborative processes and frameworks. A variety of tools and approaches are available to practitioners for increasing different types of actors' engagement in landscape governance, particularly for reducing imbalances of knowledge and power that have traditionally limited the contributions of local actors to landscape level governance decisions.

Building governance systems that include diverse public, private and civic sector stakeholders and multiple levels of jurisdiction for decision-making in the governance of complex landscapes requires new ways of thinking and new practice. This study has attempted to capture current knowledge about paramount challenges, strategies and innovations that characterize pursuits to make landscape governance work, and thereby help to bring about the new thinking and practice that is needed. Investment in developing capacities for the co-design of landscape governance systems stands to further accelerate the collaborative learning and practice that will lead to the robust, effective and sustainable performance of landscape governance systems at multiple scales.

1. Governance of landscapes for people, food, and nature

1.1 Landscape approaches to address complex social and natural challenges

Throughout the world, innovative efforts are being pursued to couple the sustainable governance of ecological resources and human activity within a common framework. These efforts seek to realize multwiple ecosystem services and livelihood benefits for diverse stakeholders within the same geographic location. At the same time, advances in the study of socio-ecological systems (Liu et al. 2007) and the corresponding practice of integrated landscape management (FAO 2005; Scherr et al. 2013) are rooted in the growing recognition that nature conservation need not necessarily pose a trade-off with development. Rather, investments in conservation, restoration and sustainable ecosystem use are increasingly viewed as potentially synergistic in generating ecological, social and economic benefits and providing solutions to 'wicked' problems (de Groot et al. 2010). Landscape approaches to achieving food production, natural resource conservation, and livelihood security goals seek to better understand and recognize interconnections between different land uses and the stakeholders that derive benefits from them (Milder et al. 2012; Sayer et al. 2013). As inhabitants of landscapes and other practitioners continue to experiment and innovate with the scaling-up of landscape approaches from their diverse entry points, emerging institutional issues of multi-level and multi-actor governance pose an imminent challenge to successfully realizing multiple outcomes from landscapes.

1.2 Elements of landscape governance and arising issues

'Landscape' is a construct that helps us to communicate about and manage areas that are shaped by interactions between humans and nature; it serves to improve linkages between people and nature and is a part of our heritage that we hold in trust. As people living inside and outside a landscape seek from it a wide range of qualities and benefits, the divergent values and interests of multiple types of actors at different levels create new challenges for governance. Consensus across multiple disciplines, spanning the ecological, political, and geographical, concludes that a core challenge for addressing complex problems bridging social and ecological systems is effective governance at multiple levels[1]. Yet the inhabitants of landscapes and other practitioners struggling to implement landscape approaches often focus on one level, whether international, national, regional or local (Nagendra and Ostrom 2012). Multi-level decision-making for the governance of landscapes is needed to link decision-making across scales and actors to address the complex issues that arise in governing social-ecological systems (Gorg 2007). However, the way in which the issues of scale and multi-actor governance are conceptualized and

1. Such disciplines include and are not limited to environmental sciences, ecosystem and environmental management, social-ecological science, ecology, landscape ecology and planning, political science, public administration, geography, spatial planning, land use planning and policy, and new institutional economics. See Veldkamp et al. 2011; Termeer et al. 2010; Hahn 2011; Gorg 2007; Cash et al. 2006; Young 2006; Millennium Assessment 2003; Beunen and Opdam 2011; Higgins et al. 2012; Enengel et al. 2011; Scott 2011.

the manner in which solutions for viable governance systems are designed, is emergent and variant.

As actors within and outside landscapes come together from multiple levels to formulate better landscape governance, new questions arise as to how to join common and disparate views on what exactly should constitute a landscape and what expected outcomes should emerge from the management of the landscape. Governance, in the context of multifunctional landscapes, is needed to reconcile among diverse actors what functions will be located where, and the rules that determine who has rights and benefits to what resources at what time, as well as ways in which to enforce those rules. Governance processes also have to answer the fundamental question of who decides such questions based on what values, and who is included and excluded from activities and benefits linked to different functions within the management of complex landscapes. Decision-making processes that can accommodate diverse values, interests, and knowledges while balancing the influence and power among different types of actors are needed to formulate a common vision and maintain it in the face of dynamic socio-ecological change in the landscape. To do so, robust institutions capable of traversing scales and levels are needed to provide the mechanisms and incentives by which public, private and civic sector actors can cooperate to realize their desired outcomes.

There are diverse uses and understandings across disciplines of the term governance. This paper's use of the term is not aligned with any one discipline. At its core, the term governance denotes the inclusion of multiple non-state actors in deliberating and deciding society's most pressing issues and their solutions, and refers to new spaces where increasingly complex problems can be solved by multiple types of actors. Landscape governance is thereby concerned with the institutional arrangements, decision-making processes, policy instruments and underlying values in the system by which multiple actors pursue their interests in sustainable food production, biodiversity and ecosystem service conservation and livelihood security in multifunctional landscapes.

1.3 Purpose, methodology and organization of the paper

Challenges in the co-design of viable landscape governance systems provoke incumbent actors and practitioners to consider ways to account for the complexity inherent in the 'multiple multiples' (Poteete 2012) that landscape governance systems imply. While much has been learned by landscape inhabitants' management practices over many decades and practitioners are generating a great deal of experience with governance issues for landscapes, there has been relatively little socializing of the knowledge that has been gained. Hence, knowledge gaps constrain the further development of landscape governance systems. By eliciting the experience, questions and insight of landscape actors, practitioners and the researchers who study and assess their practice, this pa-

per seeks to identify the practical elements needed to help guide the growing community of landscape leaders and practitioners to move toward more effective co-design of landscape governance systems.

1.3.1 Methodology

This working paper is built around the experience of landscape actors, practitioners and the researchers who study and support them by bringing forth evidence about the challenges they face, their strategies and their successes. Principal sources of data for the paper include:

1. Literature searches, which were designed to elicit research articles and book chapters that pertain to landscape governance, and also to analogous management systems that are expected to provide insight into challenges, strategies and successes in landscape governance. Examples of analogous systems include watershed management, ecosystem management, forest management and others identified in Section 4 of the paper. References to literature revealed through the search are catalogued in a Mendeley database for use by readers of this working paper, available at http://mnd.ly/1ebzZYu and described in Annex 1.
2. Proceedings from a panel discussion on landscape governance that was conducted at the Global Landscape Forum (GLF), a side event of the Conference of the Parties to the United Nations Framework Convention on Climate Change (UNFCCC COP 19) held in Warsaw, Poland in November 2013. Annex 2 provides the details of the methodology used in the panel discussion at the Global Landscapes Forum.

These knowledge inputs are supplemented by proceedings of an expert discussion on landscape governance conducted at Cornell University in October 2013. Annex 3 identifies the key questions and highlights from faculty responses from this expert discussion.

1.3.2 Organization of the paper

This paper is organized as follows. Section 2 examines the key challenges that practitioners are grappling with in both conceptualizing and co-designing landscape governance systems.

A snapshot of what appears known about and agreed upon in landscape governance that may be useful to landscape practitioners is presented in Section 3. Discussion about places and ways that innovation and learning about landscape governance is occurring is the focus of Section 4. The idea of 'analogous management systems' is introduced to identify contexts in which experiential learning that offers lessons to practitioners is occurring. Section 5 identifies prominent policy instruments for viable landscape governance.

Section 6 presents a simple framework to help guide practitioners in the co-design of essential elements of a viable landscape governance system within their own socio-ecological contexts. Section 7 looks at moving towards better co-design of landscape governance and describes eight elements that emerge as particularly important to the process. In Section 8, the paper explores strategic pathways for expanding useful knowledge about landscape governance. The paper concludes in Section 9 by suggesting what lies ahead for landscape leaders and practitioners as they continue to experiment and move towards viable co-design of landscape governance systems.

Three participants in a Focal Landscape Dialogue in Sri Lanka examine a diagram showing ecosystem flows through a landscape. Photo: Raffaela Kozar/EcoAgriculture Partners.

2. Challenges in landscape governance

The task of developing landscape governance systems that enable multi-actor decision-making processes at multiple levels inevitably is fraught with challenges. Putting into practice viable landscape governance systems that account for multiple actors, levels, scales and sectors presents the predominant challenges of

1. negotiating what and whose landscape is being governed,
2. reconciling social and ecological boundaries and scales,
3. resolving governance options and metrics of evaluation, and
4. balancing power dynamics.

2.1 Negotiating what and whose landscape

Landscapes, being human constructs, may be defined from the perspective of a farmer, a family, a village or a larger social unit. As the scale increases, goals may become broader and perspectives more divergent. The social structures concerned as well as the types of ecosystems present will determine the scale of the landscape and the scope of landscape uses, and therefore options for management. Furthermore, boundaries within and between landscapes will tend to shift over time owing to changes in use or policy. For example, as cultivated agriculture increases in area, land for conservation, hunting or pastoral use will become more limited. One of the associated governance challenges is to negotiate and resolve land use and boundary changes in the context of the wider landscape, and not to limit deliberation and decision-making about land use conversion to the local level.

Deciding what ecological or functional components to include in a landscape requires consideration of the uses people require for their livelihoods. For example, will one large catchment be sufficient for meeting the livelihood needs of resource users, or will they require a number of smaller catchments nested within a river basin? The governance challenge lies in the need for collaborative deliberation of each decision about a component. This involves bringing together diverse groups within a landscape to agree on what is a landscape within their particular context, and to make decisions that are cognizant of the implications for all the direct and indirect users and beneficiaries.

2.2 Reconciling social and ecological boundaries and scales

A major challenge in governance lies in the overlapping and mismatched policies and institutional mandates across landscape boundaries when these are defined by ecological features or characteristics. While sometimes the two co-

incide, more often ecologically defined landscapes cut across administrative and political boundaries. Indeed some landscapes cross national boundaries. Corresponding with this concern is the common difficulty of overlaying biophysical and resource use maps with administrative maps so that the respective units can be adequately discerned and compared.

Among outcomes that stem from unaligned decision-making and ecological boundaries is the common reality that 'natural' or less developed parts of landscapes such as a riverine woodland or grass hillside are given less emphasis in governance arrangements than the "more productive" parts such as areas under cultivation or irrigable rivers. Yet all of these components are important to the integrity of the landscape system. Examples of how degradation upstream in a landscape can result in reduced amounts and quality of water available downstream are common.

Different ecosystem service and livelihoods benefits have a relative importance at different scales and to different actors. For instance, livelihoods benefits are often of paramount importance to local users and farmers while ecosystem service benefits are valued at global levels. Identifying ways to simultaneously achieve local livelihood benefits, national economic benefits and global environmental benefits while also increasing production for communities is a core challenge (Bunning 2013). A governance challenge inherent to systems embedded across multiple scales is reconciling the importance of multiple functions and benefits to actors at different scales.

Current practice often is initiated and conceptualized as a set of actions at one level. Yet, the needed actions for the performance of landscapes are influenced by actors from multiple levels (Knuppe and Pahl-Wostl 2013). Some evidence indicates that it is difficult to maintain effective governance arrangements that are already working at one level when horizontal or vertical interconnectivity increases across scales (Brondizio, Ostrom and Young 2009). Another governance challenge lies in designing institutions that perform across and in harmony with institutions at other scales. The complexity of multiple scales in governance requires understanding, tools and capacities that have yet to be fully developed and applied.

2.3 Governance options and metrics for evaluation

The type of governance options under consideration will vary with the existing institutional infrastructure and priorities of actors. Options may differ widely from, for instance, developing new collaborative frameworks within existing governance systems, or initiating new governance arrangements that engage actors and decision-making units that were not formerly present or visible. The governance challenge lies in bringing diverse actors together to inform knowledge on existing institutional infrastructure, and deciding who should be engaged in conceptualizing and facilitating viable governance arrangements.

The process of deciding upon landscape governance options can be aided by developing metrics for sustainable landscapes that enable actors and policy makers to conceptualize what is being governed. As a landscape can be both a functional unit, and a scale for managing resources that are important for nature as well as people living in the landscape, it is useful to develop metrics that reflect both understandings. The process of developing metrics for assessing multiple desired outcomes from landscapes, and trajectories for change, presents a critical opportunity for stimulating collaborative learning and decision-making that can help hold managers accountable for the status and health of landscapes. Bridging multiple types of actors and knowledge forms to identify a few strategic landscape metrics that different actors, sectors and levels can own is the challenge (Simons 2013). In particular, the lack of recognition and value given to indigenous knowledge in measuring and assessing landscape change is a persistent barrier to reconciling diverse values in defining landscape metrics (Campbell 2013).

2.4 Balancing power dynamics

Power is commonly imbalanced among all the actors with a stake in a landscape. The uneven distribution of power is made more complex by actors operating in multiple actor networks at various levels and scales. Power imbalances take a variety of forms and have far-ranging consequences for representation of divergent values and outcomes in landscape governance.

One of the key challenges for landscape governance lies in reconciling the different knowledge systems that different actors bring to the table and use to justify their individual actions (Treakle and Krell forthcoming). Private sector actors may appear to play by different rules because of their operating scale or level of resources. It can be challenging to get private sector actors to the table without allowing them to dominate the deliberation and decision processes. Farmers and other local land users are often 'disempowered' in governance networks, thereby diminishing the value of their knowledge and decision-making roles. Increasingly common, local inhabitants are left to become observers and nearly powerless in their own landscape as a result of land that has been expropriated from under the management of the customary governance system. Indigenous knowledge often is not fully recognized by scientists and policymakers, limiting the power of local people in landscape studies that shape policy decisions. Sector institutions are often capacitated in governance mechanisms at the expense of democratically elected governments–particularly the decentralized local government units at district, sub-district or municipality and sub-municipality levels.

Increasing globalization of environmental governance and the simultaneous rise in interest of regionalization brings together shared interests and values in a landscape, thereby increasing the linkages among actors at multiple levels important for landscape governance. Yet these same governance benefits raise

"Increasing globalization of environmental governance and the simultaneous rise in interest of regionalization brings together shared interests and values in a landscape..."

concerns that the needs and interests of stakeholders who are not residents or employed in the landscape may begin to outweigh the needs of those who depend directly upon the landscape for their livelihoods (Penker 2009). In addition, although higher level actors are consistently well represented in lower levels of action, it is rare for lower level actors to be engaged at higher levels (Elbakidze et al. 2010; German et al 2012). The governance challenge encompasses balancing power and means of actors at various levels, some of whom are better endowed or whom have institutional mandates that permit them to have a greater degree of influence across levels.

Power relations raise issues that many development and conservation organizations are uncomfortable with addressing, often citing them to be too political. Failing to address them leads to further imbalances, as deliberations become one-sided and participatory processes lose legitimacy.

In the following section, we explore further the myriad challenges inherent in designing viable landscape governance systems by examining current knowledge about effective landscape governance.

Ugandan farmers participate in a training on sustainable agriculture and climate change mitigation. Photo: Seth Shames/ EcoAgriculture Partners.

3. Snapshot of landscape governance

Landscapes, or place-based social-ecological systems, are increasingly seen as a natural spatial-based unit on which to focus on governance (Brondizio, Ostrom, and Young 2009). Through increasing regionalization, a resurgence of interest in place-based cultural landscapes has encouraged policymakers to apply current policy schemes such as sustainable development to these units (Janssen and Knippenberg 2012). Together with the establishment of new global policy spaces such as the first Global Landscapes Forum[2], these opportunities for collaboration make previously unavailable arenas for advancing landscape governance accessible (Tutwiler 2013).

Similarly, more integrated sector strategies and planning instruments applied to landscape units creates spaces where experimentation with governance arrangements may take place. Some of these opportunities for innovation or evidence building lie in not yet fully implemented policy that implies new governance arrangements. For instance, much good policy exists on decentralization and devolution, yet it is implemented poorly or not at all.

This opening of new spaces, albeit where there is overlapping regulation and institutional arrangements, creates a need for new systems of governance (Enengel et al. 2011; Elbakidze et al. 2010; Penker 2009). Yet at the same time, both the opportunities and complexities of integrating the values and interests in multiple and varied outcomes from landscapes by divergent actors, is argued by some to call for equally complex governance systems capable of responding robustly to this multitude of multiple levels, actors and scales (Nagendra and Ostrom 2012). In the next section we explore some new forms of governance that may offer useful experience to address such complexities in the practice of landscape governance.

3.1 An emerging concept and practice

New forms of governance that encompass a shift from more traditional state-centered government to greater horizontal inclusion and distribution of power among civil society and private sector actors have been widely discussed in the context of decentralization, and recently applied to landscape development and adaptation (Hahn 2011; Beunen and Opdam 2011; van Oosten and Hijweege 2012). Governance networks, self-organized governance, and network governance all refer to governance that emphasizes the role of civil society, with respective emphasis on

1. its organization in horizontally (cross-sectoral) and vertically (hierarchically) linked networks,
2. its voluntary leadership and increasing power in relation to the state, and
3. the social capital embedded in these networks that shapes policymaking[3]

2. The first Global Landscapes Forum was held in the margins of the UNFCCC COP 19 in Warsaw from November 16-17, 2013 and brought together stakeholders from the former agriculture and environment days previously held in separate policy spaces.
3. See Brondizio, Ostrom and Young 2009; Hahn 2011; Knuppe and Pahl-Wostl 2013; van Oosten and Hijweege 2012.

> *"Landscapes are contested and idiosyncratic, and link citizenship to place while contributing to national identity and nation-building."*

Adaptive governance is a form of this new governance that responds to complexity, uncertainty and change with resilience. Adaptive governance systems are flexible, collaborative, and learning-based (Folke et al. 2005). Deliberative governance systems encourage the creation of diverse structured public policy spaces where multiple types of actors may deliberate agendas important to their worldviews and values (Hendriks 2009).

The concepts of multi-level governance and nested governance refer to systems that deal with institutional arrangements at multiple scales (vertically and horizontally) that are interconnected and complementary. Nested governance often refers to the designation of distinct roles and responsibilities in hierarchical governance tiers through powers of decentralization or devolution (Brondizio, Ostrom and Young 2009; van Oosten and Hijweege 2012). Polycentricity denotes the dispersed nature of authority and accountability among and across these multiple actor networks and scales through their tendency toward self-enforcement and spontaneous organization, interaction and coordination. Polycentric governance thus emphasizes the uptake of 'preferred solutions' through the self-organization of collective action in these complex arrangements (Folke 2005; Nagendra and Ostrom 2012). We have reviewed a number of governance forms that have shown promise in informing the co-design of viable systems for landscape governance, though they have yet to be operationalized at scale or embedded in the practice of landscape governance (Brondizio, Ostrom and Young 2009).

3.1.1 What is landscape governance?

Landscape governance is foremost concerned with multi-scale governance arrangements for decision-making by multiple networks of actors within a spatial context. Landscape governance is dynamic, as ecological and social scales, and the actor networks that occupy them, continuously change while new policy spaces for regulating these changes simultaneously evolve in continuous feedback cycles.[4]

Landscape governance brings the dimension of the political to the social dimensions of landscape, which traditionally have emphasized cultural or economic elements such as cultural heritage, tourism and production. Landscapes are contested and idiosyncratic, and link citizenship to place while contributing to national identity and nation-building. This political dimension implies that landscape governance is 'messy', as it is challenging to regulate or to formulate policy responses due to the multiple functions, structures, processes, traditions, values, and actors operating at various levels. The aim of landscape governance therefore is to engage in multi-actor decision-making in the 'messy,' or more contested spatial areas of landscapes, to address the needs and realize benefits for diverse stakeholders. The political aspects of landscapes encompass the opportunities for reconciliation of multiple values across levels of gov-

4. See Beunen and Opdam 2011; Brondizio, Ostrom and Young 2009; Gerber and Knoepfel 2008; Gorg 2007; Janssen and Knippenberg 2012; Nagendra and Ostrom 2012; van Oosten and Hijweege 2012.

ernance in a manner that is consistent with the vision of the stakeholders who live there.[5]

Landscape governance is progressively viewed as a promising practice to regulate and manage multiple resources, functions and outcomes from the landscape. Landscape governance accepts complexity in the form of multiple actors, institutions, scales and sectors, and takes into account the local specificity of the characteristics and rules relevant to each landscape. Ideally, decision-making concerning the landscape is based on adaptive learning through collaborative processes that stem from the co-design of viable landscape governance by multiple actors spanning public, private and civil society. Landscape governance encourages collective action through the use of social capital at multiple scales (horizontal and vertical) for multiple outcomes from the landscape.[6]

3.1.2 Management and governance systems

The relationship of management to governance systems is useful to clarify because many functions of governance systems are handled in management practices at one or more levels. Management is an everyday action that enables actors to perform the needed functions for governance systems outcomes. Management includes the technical and operational functions of the governance system, such as preparing, planning, assessing, sharing knowledge, implementing and monitoring a set of actions designed to achieve multiple outcomes in the landscape (Pahl-Wostl 2009; van Oosten and Hilweege 2012). Governance encompasses the actors, institutional networks, rules and policymaking processes that shape the day-to-day practical actions of management (Pahl-Wostl 2009). In the co-design of landscape governance systems these management practices are embedded in multiple actor networks at multiple scales and shaped by the larger structures, qualities, processes, capacities and policies (rules and regulations) of the governance system. Management functions can be debated in particular networks in the governance system and assigned to one or more actors in the network.

Co-management and place-based management have been noted as management systems that offer ample qualities and lessons for the co-design of viable landscape governance systems. Co-management brings together state and non-state actors in the management of natural resources. Place-based management "integrates many functionally distinct activities within a spatially delimited area" (Brondizio, Ostrom and Young 2009). Integrated landscape management (ILM) is an application of place-based management that integrates conservation, production and livelihoods objectives and outcomes in a set of multiple and functionally distinct activities in a landscape whose boundaries are determined by its users and stakeholders (Scherr, Shames and Friedman 2013).

5. See Enengel et al. 2011; Gerber and Knoepfel 2008; Janssen and Knippenberg 2012; Scott 2011; van Oosten and Hijweege 2012; Watts and Colfer 2011.

6. See Beunen and Opdam 2011; Brondizio, Ostrom and Young 2009; Gerber and Knoepfel 2008; Gorg 2007; Janssen and Knippenberg 2012; Knuppe and Pahl-Wostl 2013; Nagendra and Ostrom 2012; Southern et al. 2011; van Oosten and Hijweege 2012.

Based on the understanding of landscape governance developed in the preceding section, we move next to better comprehend its current state of practice and study.

3.2 The status of landscape governance

Landscape approaches are still firmly embedded in various sector-based entry points, yet increasingly found in new more holistic and integrated policies and governance arrangements (Southern et al. 2011). Landscapes, although embodied in the European Landscape Convention (Council of Europe 2000), are still without a common definition accepted by the United Nations. The term landscape itself is still contested along multiple continuums and thus subject to the current political mood (Scott 2011).

In contrast, ecosystems and biodiversity are regulated through various global conventions such as the Convention on Biological Diversity and embedded in legislation from the national to local. Van Oosten and Hijweege (2012) refer to the 'formal constellations of governance' and suggest that landscapes remain outside the formal mechanisms of "institutions of law, regulation, political mandate, and delegation of power." Landscapes' lack of such status hinders similar legislation and the recognition needed for the governance of landscapes (Scott 2011).

Yet as landscape governance has begun only recently to be recognized, and examples of successful landscape governance in practice are rare, they do exist (Gorg 2007; Olsson et al. 2004 in Southern et al. 2011; van Oosten and Hijweege 2012). Landscape governance is being applied in multiple domains in multiple regions, from protected area governance and protected landscapes status in Europe to collaborative forest landscape governance in the tropics, although researchers point to little in the way of science to support such governance regimes (Colfer and Pfund 2011; Janssen and Knippenberg 2012).

What is known about landscape governance from long-practiced customary governance traditions is yet to be widely applied to the current design of complex and multilevel landscape governance systems (German et al 2012). The practice of landscape governance includes examples in Europe (LIFE-nature, Natura 2000 and protected landscapes), Australia (Landcare), Japan (Satoyama landscapes), tropical countries (Landscapes Mosaics) and customary governance examples from South America to Sri Lanka (Enengel et al. 2011; Sayer et al. 2013).

Much of landscape governance is assumed to take place within governance networks due to the high degree of connectivity at various scales and levels and the inclusion of multiple types of actors. This tendency towards favoring voluntary, self-organized or informal governance networks is thought to be driven in part by the lack of available policy spaces for local actors who depend directly upon landscapes for their livelihoods to partake in landscape gover-

nance (Penker 2009). Indeed, governance networks are thought to promote flexibility, adaptation and innovation, and enhance collaboration and social learning among diverse knowledge types in the governance of complex social-ecological systems (Hahn 2011). Yet governance networks are also considered subject to greater problems with efficiency, legitimacy, and equity and also less recognized as viable landscape governance systems by traditional centralized government or formal markets (Nagendra and Ostrom 2012; Van Oosten and Hijweege 2012; Folke et al. 2005).

Even in countries where a dominant centralized government mechanism has put in place new policy spaces for landscape governance, such as England and Rwanda, the processes and functions are fragmented across sectors and jurisdictions, or not fully realized in implementation (Enengel et al. 2011; Southern et al. 2011; Scott 2011). Still other landscape governance systems combine more than one governance mechanism (central, hybrid, market, or network) in the same landscape, and central landscape governance mechanisms are thought to benefit from linking with market and networked mechanisms that have particular institutional arrangements. These might include nested intersectoral arrangements, or horizontal coordination mechanisms such as multi-stakeholder platforms, statutory committees or forums (Elbakidze et al. 2010; Penker 2009). On the other hand, where landscape governance is taking place through various forms of new governance, it is contributing to the embodiment of local interpretation of rules and rights at multiple levels and demonstrating how flexibility, innovation and iterative learning can begin to contribute to an emerging consensus on the concept and practice of co-design of landscape governance (Penker 2009).

The current status of landscape governance offers many possibilities for designing and testing new governance arrangements for more effective outcomes on multiple landscape goals. Much remains to be learned about governance arrangements in the context of complex and multilevel governance systems.

3.2.1 Accountability in new governance arrangements

When more than one actor or organization in a governance network co-owns the process, 'shared or extended' accountability results (Hahn 2011). This shared accountability can foster synergies and bring about outcomes from collective action not possible without such new governance realms. Yet because these networks lie outside of or overlap with elected representatives and the state, and often are self-organized or voluntary, they raise questions of accountability and representation.

The risks of experimenting with new governance arrangements in these spaces may be the enablement of non-state actors to the detriment of the interests and authority of elected representatives and marginalized and weaker groups (Hahn 2011). These networks are also sometimes feared to contribute to rising

power inequities among groups and segments of society. Decentralized local governments, which have legitimate authority and delegated competencies for spatially relevant governance, often are the weaker actors and lack financial, structural and technical capacities to fully implement their powers (Kozar and Clappers 2010).

Despite governance arrangements that emphasize horizontal integration, sometimes the focus is limited to bringing sectors together (such as agriculture and conservation) and local authorities are still left out of the picture. Parallel authorities at the local level can also complicate the line of accountability, as traditional and elected authorities have overlapping functions, and traditional authorities often have greater legitimacy while local elected authorities have been vested rule-making power (Antwi et al. 2011; Ratner et al. 2012).

As practitioners and intervening institutions from higher levels (including international and national institutions from both state and private sector) are engaged in various governance arrangements, they need to be aware of what Ribot (2011) terms 'institutional choice'. This pertains to the 'choice of the locus of authority' of either actors or institutions, and how those choices impact the accountability and legitimacy of the arrangements for effective landscape governance. This choice in investment by intervening actors (external and internal) and government is not limited to channels of financing, but extends to the recognition of authority and other powers.

3.2.2 Contribution of landscape science to governance design

"...landscape science...seeks to understand the relationship between people and their environment, with a focus on land use and land resources and their dynamics at the landscape scale."

The term landscape science is being used in the literature to refer to research that seeks to understand the relationship between people and their environment, with a focus on land use and land resources and their dynamics at the landscape scale (Robinson and Carson 2013). Landscape scientists have fruitfully explored and elaborated multidisciplinary issues such as the spatial multilevel character of landscape processes and governance systems (Veldkamp et al. 2011), the behavior of individuals and society regarding land management decisions (Matthews et al. 2007), the ways in which people and land are connected to the broader world (Lambin and Meyfroidt 2011), and future and past drivers of landscape change (Claessens et al. 2009). Their work suggests that landscape approaches have potential to sustainably reshape land use and resource management at local, national and global scales.

To realize this potential, a number of authors have synthesized current landscape research activities and listed a range of future research needs to take this interdisciplinary science forward (Rounsevell et al. 2012; Sayer et al. 2013; Sohl and Claggett 2013). For example, authors have flagged a lack of conceptual background that supports measuring and overcoming the scale and goal mismatch between management at the farm level and the demand for public goods and services at the landscape level (Pinto-Correia and Kristensen 2013).

Also missing are frameworks to design multifunctional rural landscapes based on adaptive approaches in low-income areas (O'Farrell and Anderson 2010).

Europe has an extensive tradition of landscape level research, but experiences in cultural landscapes in highly developed Europe, often with a strong emphasis on aesthetic and cultural values, are not by default transferable to landscapes where people have a higher dependence on the landscape for their survival. Several publications have stressed the gap between science, policy and implementation, and demonstrated the necessity of engaging with stakeholders at multiple scales in order to mainstream the concept of multifunctional landscapes into management practices (O'Farrell and Anderson 2010) (Ruckelshaus 2013 et al.; McIntosh et al. 2011).

Scientists need to play a role also in providing effective indicators and methods for landscape monitoring and evaluation. As the adage says, "one manages what one can measure". The involvement of scientists in this process would allow for better adaptive management in pursuing multifunctional landscapes over time.

It is suggested that the failure of a widespread uptake of landscape approaches is due to a lack of interest or even competence to adequately address location-specific questions among the scientific community of landscape researchers (Antrop 2005). To better meet the practitioner's needs, landscape science could explicitly aim to support landscape design for locally defined needs of multiple stakeholders. For local applications, these support tools must become more accurate and better communicate levels of uncertainty.

In the next section we turn attention to better understanding landscape actors and practitioners' experiences and needs in the design of landscape-specific governance systems.

4. Experience from the field: analogous management systems

As introduced in section 3, multiple new forms of governance and management systems are part of the experimentation and innovation around landscape governance while much of the learning from traditional management systems is yet to be adapted in robust multi-level landscape governance systems. To move towards landscape governance, where can we find on-the-ground experience to inform the co-design of viable systems? In this section we begin to explore some of the diverse spaces that may provide evidence for use in the design of viable landscape governance systems.

4.1 The rich experience of diverse communities of practice

In response to the increasing recognition of complex problems that go beyond a single issue, practitioners are experimenting with approaches that go beyond traditional sectors and embrace strategies with multiple objectives and outcomes. These diverse approaches, often operating at a landscape scale, offer strategies for the management of all major natural resource units. They comprise management systems with singular entry points, a dominant ideology or underpinning discipline. All of these may contribute to or comprise management systems that integrate food security, agriculture, ecosystem conservation, human well-being and other values at a landscape scale. We introduce these systems as analogous management systems to integrated landscape management.

These analogous systems demonstrate multiple elements relevant for landscape governance, and are expected to provide insight into challenges, components, strategies and successes in landscape governance. Two different pathways by which analysis of analogous management systems can provide insight into viable landscape governance systems are identified. First, landscapes, which bridge social and ecological scales, are often thought to enlarge the spatial unit of reference and to interlink multiple levels and social scales, thus creating larger management units (Elbakidze et al. 2010). Therefore, a landscape framework or understanding is often thought to be able to inform the scaling-up of management systems from village to larger scales. Many practitioners have begun experimenting with landscape frameworks and perspectives and how the institutional frameworks of such approaches can interact with larger spatial and social scales.

Secondly, each analogous management system is thought to already be a space where practitioners have been experimenting with elements of landscape governance systems. For example, landscape also resonates with the term ecosystem and ecosystem approaches of the Convention on Biodiversity (CBD), and links ecosystems into an IUCN product–the red list of ecosystems. Thus, some ecosystem-based management approaches have been thought of

Opposite: In Borana, Ethiopia, farmers tell researchers how they are adapting to extended droughts and changes in the local land tenure system. Photo: Anton Eitzinger/CIAT (cropped).

as partially synonymous with integrated landscape management. Recently, over eighty terms used by English speakers were identified that refer to types of land and resource management that integrate food security, agriculture, ecosystem, human well-being and other values at a landscape scale with a variety of 'entry points', any of which might provide insight into landscape governance (Scherr et al. 2013).

These analogous systems comprise the following four groups based on the primary resource unit, e.g. land, forests & biodiversity conservation, water, and ecosystems:

1. Systems that recognize land based agriculture or livestock as major components, such as
    a. sustainable land management, agroecological and agricultural and environmental management;
    b. multiple landuse production system and crossproperty land stewardship;
    c. grassland, rangeland and holistic land management; and
    d. territorial, integrated, and community-based natural resource management and integrated place-based management;
2. Systems that have forest and biodiversity conservation as major components, such as
    a. community-based, participatory, and community forest management and community forestry;
    b. multiple-use, multi-purpose and multifunctional forest management;
    c. sustainable, sustainable production, non-timber forest product and sustainable forest landscape management;
    d. protected area, buffer zone, agrobiodiversity and biosphere reserve management;
    e. integrated conservation and development approaches, collaborative natural resource management and collective environmental management; and
    f. various forms of collaborative or participatory forest landscape governance;
3. Systems targeting various water resource units including
    d. water, wetland, catchment, watershed, river basin, coastal/marine and irrigation management;
    e. integrated water resources management (IWRM); and

   f. collaborative water governance;

4. Systems oriented toward ecosystems that consider systems theory, sustainability, ecosystem science, system science, and development approaches that aim for cross-sectoral or integrated approaches, such as

   a. ecosystem, ecosystem-based, ecosystem services and sustainability management;

   b. integrated resource, bioregional and ecoregional management;

   c. integrated rural, sustainable, sustainable human, territorial, nexus and MDG-based development; and

   d. social-ecological, complex, complex natural resource, complex adaptive, coupled, human and natural, and earth systems.

We also considered adaptive management systems inclusive of their various forms such as adaptive collaborative, community-based, and transition management. Finally, we included sustainable, multifunctional, complex and agricultural, rural and cultural landscape management and particular approaches such as Landcare, Landscape Mosaics, and IUCN's Landscapes and Livelihoods approach.

Our analytical framework examined these management systems in groups based on the primary resource unit to be managed, e.g., water, land, forests & biodiversity conservation and ecosystem. In practice, however, these systems often are part and parcel of one approach or management system. For example, sustainable land management (SLM) approaches or frameworks are often implemented on a watershed scale and in tandem with holistic watershed planning. The Sustainable Land Management Program in Ethiopia (http://www.slmethiopia.info.et/) and the Kagera TAMP Transboundary Agro-ecosystem Management Programme for the Kagera River Basin (http://www.fao.org/nr/kagera/en/) are examples of such approaches. Participatory community forestry and sustainable forest management are often part of larger conservation efforts in protected area and buffer zone management, as well as other conservation and development efforts.

In the following sections we draw on innovations, lessons and emerging good practices embodied as principles (4.2), processes (4.3), institutional arrangements (4.4), integration mechanisms (4.5) and knowledge systems (4.6) that inform elements of what works in co-designing viable landscape governance systems.

4.2 Principles

Practitioners have identified the following principles as applicable to the co-design of viable landscape governance stemming from good practice in a wide variety of analogous management systems.

Box 1. Learning from systems thinking and ecosystem-based management principles

Ecosystem-based management is a place-based approach to the sustainable use of natural resources. It focuses on the complex interactions between humans and their environment. Through this dual focus on human and natural systems, ecosystem-based management succeeds prior conservation-based management structures that focused only on natural resource management. By adopting a social-ecological system approach, ecosystem management practitioners incorporate the sustainable management of resources for ***the current and future benefit of both humans and nature.***

The basic tenets of ecosystem management include learning based on science and local knowledge, an emphasis on protecting or restoring ecosystem structure, and properly valuing and sustainably utilizing ecosystem services. These are achieved through participa- ***tion and equity among different types of actors at different levels.***

Since ecosystems are places, their management must involve the people living in those places. Participatory processes encourage the incorporation of local knowledge into ecosystem management structures. Many ecosystem management systems ensure local ownership through community-based institutions that support own- ***ership of both the costs and benefits of the sustainable use of eco****system services.*

Ecosystem mapping is an innovative practice that promotes participatory analysis and planning for ecosystem management. Mapping and valuation of ecosystem services can be done as a collaborative ***effort, where multiple actors work together on a single map, or as a comparative effort in which different groups create their own maps*** *and then analyze the ecosystem through a compare-and-contrast model. IUCN has utilized mapping in Papua, Indonesia, working with 17 communities to map their customary territories using local knowledge and modern technology. This type of ecosystem mapping focuses on the interactions and priorities of both the social and natural systems active within each community. It enables customary institutions to play a greater role in development, planning and decision-making by acknowledging their social priorities and land use needs. This method was so successful in addressing community*

Landscape governance systems should value the interests of multiple actors. Multiple actors often operate, work or live in a landscape and each may have slightly different needs from that landscape. Here it is important to have a common vision and shared objectives for the overall landscape. Such a vision should provide for equitable engagement, be representative, and respect indigenous technical knowledge as well as the traditional institutions of management (FAO 2012a). Ways to empower the weaker groups in society in any given landscape are needed. These may include increasing the capacity of various groups to participate and negotiate effectively and the inclusion of minorities, indigenous peoples, and women based on the principle of non-discrimination, which implies equitable negotiations and trade-offs (FAO 2012b).

Landscape governance systems should ensure effective participation of relevant actors from multiple levels. However, participation in and of itself is not enough. Participatory processes are the foundation on which outcomes are negotiated (FAO 2005). Meaningful engagement is needed from the outset. A "bums on seats" approach, e.g., counting the number of participants at workshops, does not represent impact. The tone and meaningful actions represented in the management system are more important than the rhetoric.

Landscape governance systems should promote ownership of issues among multiple actors. To achieve this, issues need to be framed in ways that people can genuinely engage, understand and own the process.

Equity and conditionality among benefits for actors at multiple levels is critical. The rules and needs should be agreed upon, distinguishing benefits that are accrued locally and their links to national economic benefits and global goods. Benefits should be distributed when shared objectives are achieved. Simple tools are needed for monitoring that rules and conditions for benefit distributions are met, which should be employed at the most local level possible. Ecosystem-based approaches have brought rich perspective to the practical experience of embodying equity and participation in management systems. Lessons from these ecosystem-based approaches are found in Box 1. Credibility and legitimacy are derived by valuing local people's voice, knowledge, abilities and value systems. Trustworthy methods of information gathering should be used that build up the local knowledge base and expand capacity to assume responsibility for management. Action learning processes at village, district or another local level, for example, can help to build credibility and legitimacy in the governance system.

Other design principles for landscape governance may include transparency for actors to be open to what is possible and what is not; accountability, which ensures that actors responsible for implementation are held accountable to resources, process and outcome; and affordability, which ensures that the governance mechanism is affordable, employs local expertise and utilizes local resources.

Box 1 (continued)

needs while also managing natural resources that its use is now ***mandated by districts as part of the official Papua Province Spatial*** *Plan (IUCN 2012). Mapping that considers both human and natural systems and the interests of multiple actors at various levels is a* ***way in which participation and equity among different actors and social and ecological needs can be fostered in effective landscape*** *governance systems.*

Innovations for protecting or restoring ecosystem structure and properly valuing and sustainably utilizing ecosystem services, while promoting equity and redressing power imbalances, often focus on providing legal land and resource rights to farmers. In Ghana, IUCN ***supported a tree registration and certification process that gave*** *farmers the incentive to plant trees on their own land (ibid.). In West Papua, Indonesia, villagers engaged in logging in forests where they held customary rights but no legal rights, resulting in low sales prices for their timber and unsustainable logging. IUCN supported these villages to apply for village forest licenses from the Ministry of Forestry, allowing them to negotiate higher prices as legal timber producers. They also now manage their resources more sustainably, since they have assurance of their rights to the land (ibid.). These* ***types of interventions to promote more equitable benefits are vital*** *design elements for encouraging local community members to participate in landscape governance systems.*

Bridging organizations are often used as a structure in ecosystem management to integrate diverse knowledge types and improve power dynamics among various actors by balancing information inequities. While bridging organizations play important roles in advancing participatory engagement and equity across scales and ***levels, identifying them can be difficult. One innovative solution in*** *the Birris sub-watershed in central Costa Rica uses policy-network analysis. Researchers use quantitative analysis to identify bridging* ***organizations by focusing on three criteria: position, perceived influence*** *and perceived competence. This analysis allows practitioners to identify bottlenecks in information transmission and deploy resources on the most capable bridging organizations in an ecosystem setting (Vignola, McDaniels and Scholz 2013).*

Box 2. Learning about effective multi-actor and multilevel processes from forest and biodiversity conservation management

Many forests and biodiversity conservation management approaches emerged from prior experience that focused on single-sector or highly centralized management and often failed to provide the wide range of goods and services demanded from landscapes, ***or to control forest degradation. Although they differ in terms of the*** *tenure regimes represented, the constellation of actors involved, and the top-down versus bottom-up nature of their management systems, these present-day forest and biodiversity conservation management approaches are similar in aiming to engage a greater number of actors in managing land and resources for a variety of goods and services at local, national and global scales.*

Decentralization of real management and decision-making power has been a key element of integrated forest management systems, involving local communities in deliberative processes to develop strategies for long-term sustainability (Pretty 2003). Although protected areas form a part of many landscapes where integrated approaches are implemented, approaches to protection often move away from strict regulation and enclosure of forests to promote multiple use arrangements that allow for local communities to access forest resources. Multi-scale management and governance is also found in new initiatives, such as Reducing Emissions from Deforestation and Forest Degradation (REDD+), that aim to incentivize better management and connect actors in processes that address ***global and local demands for conservation and livelihood benefits.*** *Typically these systems take into consideration relationships* ***between the forest and buffer areas, and other parts of the landscape mosaic. Identifying the functions and actors in different parts of the*** *landscape and connecting the management of these areas are* ***building blocks for effective landscape governance systems.***

4.3 Processes for bridging multiple sectors, actors and levels

Any form of landscape management explicitly implies collaborative planning, bringing together diverse groups within a landscape and agreeing on what a landscape is regarding resources that are important to nature and to people living in the landscape. Collaborative processes are required to work across sectors, interlink levels, and engage multiple actors (Görg 2007; Janssen and Knippenberg 2012).

The first step is to bring the diversity of actors together in collaborative processes for dialogue and to talk about their problems and challenges (Bunning 2013). Decision-making processes in collaborative forms of governance should emphasize informed decision-making through the reconciliation of multiple actors' knowledge systems, values and interests. Collaborative processes enable decision-making by multiple types of actors to link science and design in practice (Beunen and Opdam 2011). Decision-making processes are likely to be informal and flexible to account for multiple types of actors at various levels collaborating through governance networks. Forest and biodiversity conservation management systems have evolved over time to emphasize effective collaborative decision-making processes that include a wide variety of actors from international to the local level. Lessons from this experience are highlighted in Box 2.

Landscape governance requires decision-making processes that not only are collaborative but also demonstrate an adaptive quality (Beunen and Op-

dam 2011; Görg 2007; Janssen and Knippenberg 2012; Knuppe and Pahl-Wostl 2013). Adaptive collaborative management processes are important for complex and dynamic landscape governance systems that evolve over time with changes in social-ecological systems. Ultimately landscapes will need different forms of management as conditions change and people respond to changing circumstances such as climate change. The process is not static–spatially or temporally- and therefore cannot be neatly modeled in a log frame format. The view that adaptive governance and management are 'required and must be adopted' in the governance of social-ecological systems is supported by experience from multiple analogous systems. For instance, groundwater management employs adaptive management in the governance of cross-sector resources as a strategy to manage a resource (i.e. groundwater) for which it is difficult to identify multiple functions, users and scales (Knuppe and Pahl-Wostl 2013).

4.4 Institutional arrangements

As in institutional development in general, actors working in analogous management systems confront decisions about whether to strengthen existing structures or to create new ones. New structures often undermine existing ones and practitioners commonly struggle with how to empower existing institutions. As practitioners have been experimenting with various forest, water, agricultural or ecosystem-based approaches, they have wrestled with difficult institutional questions regard-

Box 2 (continued)

These management systems have been arenas for more inclusive processes in new multi-stakeholder management platforms. While traditional management of forest commons was successful in some cases, new stakeholders, new demands on forests and new institutional arrangements have led to a variety of new platforms for ***forest management. The co-management of Guinea's classified for****ests is one such example where a combination of agroforestry innovations to improve livelihoods and reduce pressure on forests, and the reorganization of forest co-management committees to include women and other marginalized stakeholders in the decision-making process have taken place. The inclusion of new stakeholders in management plans, not only as users but as key decision-makers, required development and enforcement of a new forest code that would support multi-stakeholder management. The result has been a new arrangement for protected area management in Guinea that has more targeted management of biodiversity, diverse funding sources to support long-term and complex management, and the explicit engagement of multiple stakeholders in a more democratic management process.*

Despite good intentions, successfully integrating conservation, development and production can be an elusive goal when key actors are not engaged in collaborative processes. In the case of Takamanda National Park in Cameroon, the state implemented a new arrangement for governing the forests inside the park, supported by data on forest degradation trends and funding from international conservation organizations. The new arrangement drew together multiple actors at local, national and international levels. However, local actors were recognized only as forest users instead of as equal parties in decision-making processes.

ing which institutions are better suited to managing resources that cross scales and boundaries, and how to create institutional arrangements that effectively work with administrative structures across several jurisdictions or national boundaries.

As landscapes are comprised of multiple actor networks at different spatial scales, we can find both network and hierarchical institutional arrangements as part of centralized, hierarchical or networked governance mechanisms. Practitioners then grapple with the question whether to create an apex body for landscape management rather than build on existing networks, and whether to create a governance mechanism that is deliberative and networked rather than hierarchical. In the context of landscape management systems that aim to bridge boundaries and scales, such decisions are made more complex by the need to realize multiple performance outcomes across actors, scales and sectors. Institutional arrangements in the context of multilevel and multi-actor landscape governance systems must account for this complexity and the interactions with networks at various levels.

4.4.1 Institutional performance for multiple landscape outcomes

Institutional performance for multiple landscape outcomes requires institutions with an outward looking focus. An external focus encourages the creation of linkages with other actors and organizations and collective action to achieve complementary or common goals (Janssen and Knippenberg 2012). Empirical evidence points to numerous institutional rules to guide the design of institutional performance for common resources. However, the rules need to be contextualized in complex multilevel landscape governance systems, as some clash with new notions of distributed authority and self-organized governance for collective action (German et al 2012; Nagendra and Ostrom 2012). Investments in building up a critical mass of agents with the capacities needed for multi-functional landscape management, as well as co-construction of knowledge, need to be built into collaborative processes and development of frameworks to ensure the long-term performance of institutions for multiple landscape outcomes (Janssen and Knippenberg 2012). Desired qualities of such institutions in addition to performance are likely to include robustness and resilience (Brondizio, Ostrom, and Young 2009).

"Evidence demonstrates that institutional arrangements better determine landscape performance outcomes than the dominant governance mechanism."

Evidence demonstrates that institutional arrangements better determine landscape performance outcomes than the dominant governance mechanism (Nagendra and Ostrom 2012). Therefore, getting these structures right is crucial regardless of whether the basic system structures are ruled by central-state, market or network mechanisms. Institutional arrangements should strive for a balance among the types of actors, scales and levels engaged in decision-making to increase the likelihood of sustainable landscape outcomes (Elbakidze et al. 2010). While a multitude of institutional arrangements may support these aims, some examples of successful institutional infrastructure

found to be effective for multiple outcomes in analogous management systems are discussed in the remainder of this section.

4.4.2 Effective arrangements for multi-level and multi-actor governance

Three key types of institutional structures have been found to be effective for multi-level and multi-actor governance: networked and deliberative arrangements, vertical integration through, for instance, nested institutional arrangements, and multi-level boundary and bridging organizations. Each is elaborated below.

Networked and deliberative arrangements

Networked structures that makes use of horizontal coordination mechanisms such as multi-stakeholder platforms, statutory committees, forums, and other deliberation spaces are able to effectively link administrative structures across multiple horizontal local jurisdictions. Deliberative mechanisms within self-governed or voluntary networks are present in a multitude of spaces such as collaborative frameworks or structures embedded in planning and monitoring processes such as citizens' juries (Hendriks 2009). Co-management structures have turned out to be quite sustainable in project experience, and been proven to outlive project lifespans. Networks of farmer field schools interlinked at landscape scale have the capacity to dialogue and share experimental re-

Farmer field schools are one constellation of stakeholders that may join together through networks in multi-scale governance systems. Photo: Seth Shames/EcoAgriculture Partners.

search and data to demonstrate evidence of what works in their location-specific site (Bunning 2013). Similarly, cooperatives made up of many small farmers groups in agrobiodiversity conservation areas may be formed from several hundred farmer groups, and enable social learning processes and sharing of knowledge in commonly understood formats (Tutwiler 2013).

Multi-stakeholder platforms for landscape management, which aim explicitly to form a structure with all actors relevant to the landscape, have been instrumental in enabling stakeholders to manage landscapes for multiple values and outcomes in conversation, production and livelihoods (Milder et al. 2013). Multi-stakeholder platforms may be located in nested arrangements and provide a space for creating a framework for multi-sectoral, multi-scale cooperation.

Nested institutional arrangements

Nested institutional arrangements have been identified as a way to distribute authority, decision-making, and coordination through the engagement of organizations at multiple levels and a balance of top-down and bottom-up power (Folke et al. 2005). Nested arrangements apply particularly well in the context of landscapes because managing integrated landscapes includes nested scales of smaller to larger landscape units, and therefore institutional arrangements that mimic these scales can work well. In nested arrangements, the principle of subsidiarity is important, as local people better know the dynamics of their landscape. But we need to better link different communities together with a wider nesting approach to have larger and more inter-connected landscapes.

Nesting landscapes to larger spatial scales can become part of a political or administrative boundary. This implies the importance of organizations that think and plan at a larger landscape level than simply at the village level. Boundary and bridging organizations are two promising types.

Boundary and bridging organizations

Dedicated and honest boundary organizations that are accountable to science, policy and practice are essential in institutional arrangements. These organizations connect and synchronize the science-policy platforms, make sense of those differences and focus on synergies. Boundary organizations are specifically 'designed to facilitate collaboration and information flow between research and public policy communities,' and have found success in reconciling these spaces and diverse knowledges (Parker and Crona 2012).

Boundary organizations can play a role mediating and facilitating improved governance arrangements, and in supporting institutions to resolve conflicts as they occur to prevent them from growing to become serious conflicts. Boundary organizations are needed that do not have a direct and vested interest in the overall process, but a good understanding of the dynamics at play.

While people living in the landscape have the most knowledge of their circumstances, external experts can assist in the role of boundary organization.

Bridging organizations, a physical manifestation of social capital, may serve as knowledge brokers and connect disparate actors in governance arrangements. They can bridge levels of governance and are key actors in enabling and promoting vertical and horizontal integration in multilevel governance (Elbakidze et al. 2010). They may play a multitude of other functions in promoting this vertical and horizontal integration including 'knowledge coproduction, analytic deliberation, learning, trust building, sense making, conflict resolution, capacity building, networking, and interaction' (Elbakidze et al. 2010; Enengel et al. 2011).

4.5 Integration mechanisms

Vertical (hierarchical) and horizontal (sectoral) integration mechanisms are paramount for enabling adaptive responses by multiple actors across scales and levels in the management of resource regimes that occur at multiple social and ecological scales (Knuppe and Pahl-Wostl 2013). Integration mechanisms can help to foster interaction across 'sectors, levels of government, uses, stakeholders, and spatial and temporal scales' (Portman et al. 2012). Greater integration is expected to contribute to sustainable management of complex resource regimes through the reconciliation of various knowledge systems across actors and scales, and through increasing receptiveness to management practices and respect for decisions (Knuppe and Pahl-Wostl 2013). Two examples of integration mechanisms are setback lines and frameworks for multi-sectoral cooperation.

Setback lines

Setback lines are used in integrated coastal zone management to create distinct buffer zones between critical water resource boundaries (such as a shoreline or cliff top) and safe distances on land within which no development may occur. Setback lines have been found to be more effective in promoting integration across landscape units than other integration mechanisms (Portman et al. 2012). More lessons of horizontal integration mechanisms from analogous water management systems are described in Box 3 (next page).

Frameworks for multi-sectoral cooperation

Frameworks that can capture and promote both the complexity of horizontal and vertical integration among multiple actor networks, and the specific values of the actors dependent on the landscape, are needed for delivery of multiple performance outcomes from landscape governance systems (Knuppe and Pahl-Wostl 2013; Southern et al. 2011; Swaffield 2013). Multi-sector coordination frameworks are useful as both policy instruments, and in practice, to bring

Box 3. Learning about horizontal integration from catchment scale management systems

Water management systems often incorporate state, hybrid, non-government and market institutions. These institutions, inter-connected by coordination mechanisms, provide the necessary support for water management systems. A key feature of water management systems that helps to ensure their success is this integration. Water management activities are often scattered over large areas and across sectors, so without proper program integration and agency coordination their desired benefits are diluted. The effectiveness of implementing water management systems across sectors can serve as a useful guide for landscape governance.

Many water management systems throughout the world are improving horizontal integration of governance networks. In Karachi, Pakistan, the Hisaar Foundation developed a cost-synergy approach building upon an urban water partnership. Each partner spends its own money to carry out commitments. If a partner believes something needs to be done, it should be the first one to commit funds. Other partners can then link activities at which they excel, to create synergies such that the combined output is greater than the sum of its parts. Cost synergy was combined with the concept of mutual accountability for different stakeholders through a common universal platform for collective management and action (Siddiqui 2013). These efforts increased participation across sectors and power levels and committed the partnership to a shared responsibility for its resources.

Another innovation in horizontal integration comes from Estonia. As part of an EU-funded River Dialogue, the Emajõgi River region piloted a randomly selected panel of citizens known as a citizen's jury. This jury meets for three to five days to examine an issue in a trial-like setting and then presents its recommendations on the issue. The method was found to promote political dialogue aimed at

together diverse knowledge forms in a common vision. They have the potential to increase horizontal and vertical integration by linking actors at the same level across sectors, or bringing together actors from multiple government levels.

In practice, frameworks for multi-sectoral cooperation are essential ingredients for landscape governance systems as boundary objects created by the stakeholders involved. Without a clear long-term vision and framework of cooperation, it is unlikely that multiple actors will achieve their goals and sustain a long-term presence in the landscape. A framework for collaboration in landscape management can be very top-down, as in some forms of community-based natural resource management. On the other hand it can be very localized and conducive to action learning when used as a means to plan, implement, monitor, learn, revise and repeat the process. It is important to find a framework that works at the scale in question. Some countries, like Vietnam, require national level frameworks. In this case, the framework is the motivation behind development of guidelines and principles and can support more adaptive and flexible management at the landscape scale. We explore the lessons from use of these multi-sectoral cooperation frameworks as a policy instrument in Section 5.

4.6 Knowledge systems

In section 2 we introduced a key challenge for landscape governance as reconciling diverse knowledges across multiple actors. In the discussion above we examined the principles, processes

and institutional arrangements that embody and enable equity among actors who use their knowledge systems to justify their individual actions. When the voices of different actors are unequal conflict can arise. Thus, an essential ingredient for landscape governance is informed decision-making from different expertise and knowledge sources, and the reconciliation of differences in knowledge systems, actor interests and ambitions. Reconciling multiple knowledge systems from across scientific, practical, and indigenous sources, and across the types of knowledge that various private, public and civic actors find legitimate, is by no means simple. The essential task at hand is developing strategies for constructing landscape specific knowledge that acknowledge the value of the multiple sources of knowledge in the landscape and renders them applicable in managing the functions and realizing the performance outcomes of the landscape.

4.6.1 Constructing landscape specific knowledge

Landscape governance requires complex learning processes that allow knowledge specific to the landscape to be constructed with value attributed to local forms of knowledge (Gorg 2007). While this need to include local knowledge in landscape decision-making is commonly called for and embedded in various policy instruments, the challenge of creating decision-making processes that integrate these forms of knowledge in practice is made more difficult by the multiple actors operating at different levels, and the reality that many landscape decisions are

Box 3 (continued)

mutual understanding, encouraging actors with diverse viewpoints ***to resolve conflicts by dialogue rather than other means (Säre 2004).*** *This innovation is a useful process for a landscape governance system to achieve greater horizontal integration across stakeholders* ***with differing values.***

Innovations in Latin America and Nepal focus on the integration of water management activities with other sectors. In Latin America, ***specific water management organizations act as bridging organizations*** *to facilitate the participation of all related sectors and provide a more integrated water management structure. Bolivia, Costa Rica, Ecuador, Honduras and Peru all have watershed management* ***networks that are able to work across sectors (FAO 2004). Nepal utilizes a different approach, formally including community forestry in*** *water management activities to ensure the participation of forestry professionals and the integration of the forestry and water management sectors. This also positively impacts the upstream-down-* ***stream dynamic, with upstream communities benefitting from forestry projects and downstream communities benefiting from reduced flooding and sedimentation (Singh et al. 2004).***

Another practice to increase horizontal integration is to identify the proper scale for water management systems. Watersheds can provide a proper scale in some cases, but other locations may require ***a sub-, micro-, or even macro-watershed approach. One innovation*** *fostering greater horizontal integration is a revenue-shed approach to the Mills River and Upper Neuse watersheds in North Carolina.* ***Revenue-sheds offer a more complete scale of analysis then watersheds,*** *as they incorporate the actors who live outside of a watershed yet impact it, and those who directly live in and benefit from it.* *This approach was found to build transparency and trust across di-* ***verse actors while moving local governments with different interests toward financially investing in long-term, collaborative watershed*** *protection (Patterson et al. 2012).*

Box 4. Multi-scale knowledge management in land management systems

Land management systems include a wide variety of approaches, including rangeland management, community-based natural resource management, territorial management and agroecological ***management. One prominent system recently scaled-up across Africa*** *is sustainable land management (SLM), which integrates the management of soil, water, animal, and plant resources. SLM en-* ***ables users to maximize the economic and socio-cultural benefits of*** *land in a way that also enhances its ecological systems and services. To supplement this integrated approach, many land management practitioners are utilizing adaptive management. Adaptive management is an iterative process for addressing complex issues, with a particular focus on experiential and experimental learning. The key principle for adaptive management is the development of a robust innovation system that fosters social learning and communication. SLM and AM provide useful examples for designing landscape governance systems by emphasizing experiential collaborative learning.*

Innovation platforms have been used to facilitate interactions and learning among multiple actors addressing a common challenge. ICRAF has developed a practitioner tool for creating functional innovation platforms that is useful for developing pathways for the design of landscape governance systems (Tukahirwa et al. 2013). This tool guides practitioners through an iterative process to identify a ***problem, identify functions required for efficient systems to address*** *the problem, identify partners able to deliver the functions, and follow up on partners' commitments. Recognizing the value of the integrated and iterative approach, the tool engages multiple levels of stakeholders in the planning and execution phases. This leads to the structure for an innovation platform that can provide the needed* ***multi-scale knowledge systems for effective landscape governance.***

Many land management innovations focus on improving knowl- ***edge-sharing. In particular, farmer field schools (FFS) have proven***

made at higher levels without input from local actors dependent upon the landscape (Enengel et al. 2011). Evidence from analogous management systems practice finds that it is critical for knowledge of actors at lower levels to be conveyed to higher levels and embedded in such integration mechanisms as cooperative frameworks, where the knowledge is binding and reaches all parties (Knuppe and Pahl-Wostl 2013). However, integrating local knowledge upwards across levels is not easy. We need to have some means to build up the local knowledge base with respect to local ability to manage and assume responsibility for landscapes, sometimes including involvement in the decisions of neighbouring landscapes. Such means requires building and reconciling different knowledge systems beyond the farm, and building knowledge bases and knowledge hubs outside farm gates. This will help provide one means to bridge different forms of land use, such as cultivation, agriculture, conservation and forest landscape restoration. This needs to build on existing governance rules and how they can be improved. With some form of landscape matrix, we can frame the landscape in the context of the local people's perspectives, and not have experts say what the landscapes should do.

Thus the complex character of multilevel, multi-actor landscape governance systems demands arrangements that facilitate the 'coproduction', 'translation' and reconciliation of different forms of knowledge in multiple networks operating at different levels (Brondizio, Ostrom and Young 2009). The complexity in landscape gover-

nance calls for a negotiation-support system where various knowledge systems are understood by everyone involved, and solutions are created in a cooperative manner (FAO 2005). A first step is to understand what processes different networks in the landscape are already using to weigh and adopt various types of knowledge (Beunen and Opdam 2011). To design and build such knowledge systems will require an adaptive learning approach, and experimental learning that enables knowledge systems to stay in sync with dynamic changes in landscapes (Elbakidze et al. 2010). Robust innovation systems that foster social learning and communication can nurture such knowledge systems.

As earlier identified, a key institutional structure that is thought to provide great potential for the facilitation of knowledge across scales and levels is the bridging organization due to its unique position, capacities and legitimacy among multiple actors to facilitate across actors with diverse values and knowledge for collaborative learning, action, and coproduction of knowledge specific to the landscape (Enengel et al. 2011). Box 4 explores lessons learned from multi-scale knowledge management in land management systems. Having reviewed the rich lessons and insights for landscape governance design from landscape actors and practitioners' experiences in analogous management systems, we turn our attention now to policy that has the potential to influence and shape design choices for viable landscape governance systems.

Box 4 (continued)

successful in institutionalizing knowledge systems at multiple scales and levels. FFS in eastern and central Kenya provide opportunities for farmers to learn together through practical, hands-on methods of experimentation and discovery-based learning. As a result, farmers have a strengthened capacity to solve their own problems through iteration and innovation (Liniger et al. 2011). A similar innovation in the Sofia region of Madagascar, the Participatory Learning and Action Research Approach to Integrated Rice Management, also utilizes experiential learning. Farmers try new methods and ideas in small plots of their field, called innovation spaces, and assess the impact for themselves (ibid.).

***Trans-boundary experiences along the Onchocerciasis (river blindness) Freed Zone in Ghana and Burkina Faso provide another land management innovation, participatory negotiated territorial development (PNTD) (FAO 2005). PNTD utilizes an analytic framework** based on stakeholder views and historical context to address local territorial issues. PNTD supports local knowledge systems at multiple levels through the development and sharing of multiple learning and knowledge types that result in 'social territorial agreements'.*

*FFS and PNTD are particularly useful knowledge systems where they are integrated together in a nested governance arrangement. **The GEF/FAO Kagera River Basin Transboundary project is an example of an SLM initiative where these multi-scale knowledge-sharing systems are integrated. At the community level, a local diagnosis leads to a community action plan. Farmers utilize FFS to improve land management and production practices. At the district level, SLM is integrated into district plans and budgets. Practitioners pursue district-level partnerships for PES and investments while also transferring SLM knowledge to trainers and other district-level personnel. FAO then utilizes PNTD to improve governance at a territorial scale and harmonize district plans with national strategies (Bunning 2013). This nested institutional structure supports multi-scale knowledge systems.***

5. Policy for landscape governance

Policy for landscape governance is concerned with ways of influencing the behavior of institutions that can support the development of landscape thinking and practice, as well as the behaviors of numerous institutional actors that are embedded within particular systems of landscape governance. Our exploration of landscape governance demonstrates that public authorities at multiple levels are influential institutional actors, and that private and civic sector actors are influential as well. It follows that good policy for good landscape governance will stem from multiple sources of authority and ingenuity. Similarly, mechanisms for realizing desirable policy in practice will be combined from a spectrum of options.

Policy instruments that aid in co-designing viable landscape governance systems comprise a combination of enabling mechanisms, regulation and enforcement, and incentives. Landscape practitioners have important roles to play in forming policy that stimulates and sustains the collaborative governance of landscapes through participation in policy advocacy and design processes, in addition to making strategic use of existing policy mechanisms in their practice.

> ***"Decentralization has provided the legal framework in many countries for change in forest governance regime and thereby presenting windows of opportunity for introducing new collaborative legal frameworks."***

5.1 Enabling mechanisms

Legal frameworks, tenure, collaborative frameworks and agreements are examples of policy mechanisms that can help to bring about viable governance systems. Optimally, these and other enabling mechanisms work in concert, and are linked also with incentives and regulations to implement policy that is conducive for landscape governance.

5.1.1. Legal frameworks

Ongoing decentralization of structures, procedures and practices of governance throughout much of the world is generally viewed as producing greater flexibility in incentivizing and regulating land use and resource management. Decentralization has provided the legal framework in many countries for change in forest governance regime and thereby presenting windows of opportunity for introducing new collaborative legal frameworks. Effective legal frameworks for co-management of forest landscapes require clearly defined rights and responsibilities, as well as readily available avenues for arbitration.

Some disagreement exists as to whether multiple overlapping legal frameworks support greater flexibility for resource users, or lead to greater regulation and restriction. Meinzen-Dick and Pradhan (2001) claim that multiple legal frameworks allow more flexibility and therefore more resilience, while Ashley, Russell and Swallow (2006) argue that legal pluralism results in mul-

Opposite: CAPROCYU Cooperative members discuss the impacts of investments in integrated land management in Rukozo Sector, Rulindo District, Rwanda. Raffaela Kozar/EcoAgriculture Partners.

tiple restrictions and competing objectives, ultimately reducing resilience of resource management. The disagreement points to the importance of social and ecological context in applying and interpreting laws which vary by country, resource management system and other factors.

As we learned in section 3, national legislation can be an important policy mechanism for allowing the formation of novel place-based areas for landscape governance. The Swiss Regional Nature Parks (RNP), created by legislative action, enable the coordination of regulations and incentives without restrictions imposed by administrative boundaries. RNPs demonstrate also the use of a regulatory device to improve the coherence of a landscape regime (Gerber & Knoepfel 2008).

Penker and Wytrzens (2008) explore the extent to which landscapes can be governed by legal and social norms in Austria, in an evaluation of legal effects on landscape development. In what the researchers term a legal-ecological assessment, they reveal that gaps between intended and actual landscape effects are likely explained by determinants such as the actual knowledge and acceptance of norms by land and resource users, as well as the frequency and severity of controls and actual penalties. They argue for the use of the 'framework of crucial determinants' presented in their analysis to describe legal effects on human behavior and landscape development and thereby generate insight about opportunities for more effective landscape governance.

5.1.2. Tenure

Tenure concerns rights to owning land, trees and other resources, as well as relationships between owners and users of these resources. Across the numerous modes of land and resource tenure that have emerged throughout the world, land tenure security is probably the most important attribute of tenure arrangements for incentivizing land and resource users to invest in sustainable management practice. A principle task of viable landscape governance systems is to help foster security of tenure for legitimate land and resource users who may be using resources nested at various scales, and to link tenure security with specified rights and responsibilities across multiple actor networks at various levels. The Voluntary Guidelines on the Responsible Governance of Land, Fisheries and Forests in the Context of National Food Security were endorsed by the Committee on World Food Security in May 2012 and promote responsible governance of tenure of land, fisheries and forests, through agreed upon principles and internationally accepted standards for practices with respect to all forms of tenure: public, private, communal, indigenous, customary, and informal (FAO 2012c).

Tenure arrangements tend to be specific to nations and cultures. In the USA, for example, complex tenure arrangements are evolving, including a variety of special use easements to enable new land management patterns, and the ex-

pression of changing social values to shape landscapes. Harris, Gross and Auerback (2012) highlight land tenure changes in the Adirondack Park of New York to illustrate changing roles of the state, as well as special interests, through the participation of multiple actors in acquiring rights to land and influencing its use.

In many developing countries, land use planning (LUP) is viewed as a vital instrument for improving tenure security and promoting sustainable resource management, while also rationalizing extension services. Efforts to overcome weaknesses in local institutions in the effective implementation of land policies and land zoning practices commonly include monitoring community participation and developing better understandings of LUP processes in practice. In the Lao People's Democratic Republic, these efforts have led to the development of a methodology based on analysis of past and present land zoning practices that gives prominence to the complexity of landscape mosaics and the ways that local populations actually use the land (Bourgion 2012). Researchers engaged believe that the method can be used as a safeguard and support for inexperienced implementers in their land use planning practices, a diagnostic instrument for quality assessment, and possibly a tool for land use planning certification.

5.1.3. Collaborative frameworks

As introduced in section 4, collaborative frameworks are policy mechanisms designed to foster integration, communication, and coordination across sectors and administrative units as well as between levels of decision-making. They are used to create space for deliberation by multiple actors and/or networks of actors that incorporate knowledge and authority from multiple sources into the process. Collaborative frameworks often form the basis of co-management schemes such as transboundary collaborative management, joint forest management and community based management, among others. They can serve to link management officials at national or provincial scales to local communities and local-level management organizations (Brunckhorst 2010). The optimal geographic scale at which collaborative frameworks should function poses a persistent question in their design.

Community-based natural resources management (CBNRM) is a framework for collaboration across tenure types. To be successful, CBNRM must meet the needs and aspirations of its community members and be ecologically and socially sustainable, while evolving capacities to respond and adapt to internal and external pressures of change. Meeting the challenge of operating at the local level while nesting meaningfully within other levels and scales of socio-ecological systems can lead to novel arrangements for facilitating holistic integration that a landscape perspective can help facilitate (Brunckhorst 2010).

Collaborative frameworks can be used to support landscape policy and practice through the actions of key individuals and champions, while helping to over-

come divergent values and interests, institutional hurdles and resource limitations in cementing landscape governance systems (Scott 2011).

5.1.4. Agreements

Agreements are policy mechanisms that can help support creative collaboration among diverse actors in and across jurisdictional boundaries. Agreements can be voluntary or legally binding; their role is to specify desired outcomes from cooperation, as well as rights, responsibilities and possible penalties linked to agreed-upon intentions for land and resource use. As such, they are important tools in fostering fair benefit distribution from collaborative management. Landscape governance arrangements tend to focus on building legitimate agreements between stakeholders that clarify roles for achieving shared objectives, rather than previous "rule-based command-and-control measures" (Lockwood 2010).

International programs and institutions that impact the identity and management of resources are built upon agreements, such as the designation of a UNESCO World Biosphere Reserve or a Model Forest Network site (Preston 2012). The use of international agreements to improve landscape governance and address multi-scale concerns is exemplified by the documented influence of the European Landscape Convention on wind power and local landscape management objectives (Oles & Hammarlund 2011).

Two contrasting examples of agreements for resource governance in Australia, one a regional forest agreement between federal and state governments, and the other between the state and other actors, illustrate important considerations in constructing viable agreements. While the federal-state agreement was considered successful in reaching agreement, a failure in implementing it was in focusing on overcoming rather than resolving competition between public user groups. The latter agreement between the state and stakeholders resulted from a major forest assessment, and is considered more promising for integrating values and addressing needs at multiple scales (Brown 2002).

5.2 Regulation and enforcement

While regulation and enforcement are necessary and powerful policy mechanisms in landscape governance, the ways in which they are designed and applied are critical to their effectiveness. Conventionally, regulations are created through top-down policy processes, the authority for which commonly is far removed from the locations in which they are enforced. This characteristic of regulatory policy can stimulate local resentment and non-compliance. Developing landscape governance systems offers the opportunity to design regulatory mechanisms that can help to ensure the cross-sectoral, multi-stakeholder cooperation and benefit distribution that is needed.

Regulatory mechanisms can help bring an end to harmful land use practices, particularly when coupled with incentives to replace them with sustainable best practices. In Australia, for example, the government responded to increasing public interest in conservation by offering public co-funding for previously privately funded programs to increase re-vegetation and natural regeneration (Kyle, Duncan & Newell 2012). This innovative policy, which led to a four-fold increase in re-vegetated and naturally regenerated areas across the landscape, couples regulation with incentives by using public investment to leverage private action.

Distributing the 'burdens and advantages' of regulation evenly across multiple actors in a landscape is challenging. Gootee and colleagues (2011) illustrate this challenge of regulatory policy in the cross-boundary management of forested ecosystems at large spatial scales where forests are primarily under small scale private ownership in Washington State, USA. Natural landscape variability, disparate interests and goals among forest owners, and oversights in policy design lead to inequitable regulatory consequences. Potential solutions and implications for policy makers include the creation of policies that are responsive to the circumstances of forest owners, in addition to being responsive to the conditions of forests. The case study in Box 5 illustrates how a combination of regulatory and enforcement mechanisms led to reductions in deforestation, improved governance and the emergence of a sustainable production landscape in Mato Grosso, Brazil.

"Distributing the 'burdens and advantages' of regulation evenly across multiple actors in a landscape is challenging."

5.3 Incentives

Policies that incentivize stakeholders to engage in landscape governance commonly focus on market-based mechanisms. Appropriately valuing stocks and flows of ecological assets in landscapes and ensuring that fair value accrues to farmers, pastoralists, fisherfolk and other local land users for their stewardship helps create market incentives for sustaining their engagement in collaborative management.

Public policy that stimulates private and civic sector investment together with transparent and verifiable valuation processes and enforceable agreements among stakeholders commonly is required to ensure that market mechanisms will work in favor of local entrepreneurs. Policy design for landscape governance may benefit, for example, from regional agricultural supply chain policy, an innovative approach in Colombia that focuses on public sector support for the development of supply chain organizations at the regional level to unharness the potential of the agricultural sector as a driver of sustainable development and poverty alleviation (Parra-Peña et al. 2012).

While challenges in implementing payment for ecosystem service (PES) schemes are well documented, success is expanding as experience grows, owing to improved methods of valuation aided by spatial assessment and

Box 5. Regulatory and enforcement mechanisms support good landscape governance in Mato Grosso, Brazil

The state of Mato Grosso in western Brazil covers parts of the Amazon rainforest and the vast Cerrado. Throughout the late 20th century and early 2000s, these two biodiversity hotspots experienced high levels of deforestation primarily as a result of the rapid expansion of Brazil's agricultural frontier to meet growing demands for ***beef and soy exports. Since 2005, however, a confluence of drivers*** *has led to record agricultural production alongside a dramatic decrease in deforestation across Mato Grosso. While a combination of policy, market, enforcement and monitoring drivers were important factors, DeFries and colleagues (2013) point to Brazil's unique governance (Kaufmann 2010) and monitoring capacity (Romijn, 2012) as the key to Mato Grosso's successful transition to a more sustainable production landscape.*

One of the first and most influential drivers was the soy moratorium, *which prohibited the export of soy produced on deforested* ***land after 2006. This resulted in sustainable intensification by shifting*** *the expansion of intensive agriculture (soy production) to land*

monitoring tools, and benefit distribution agreements among stakeholders (Ferraro 2011). For example, efforts to reduce emissions from deforestation and forest degradation while providing for the sustainable management of forests and enhancement of carbon stocks (REDD+) are potential cost-effective ways to reward local communities for forestry and agroforestry goods they produce, which provide short term food security and economic returns as well as long term environmental benefits while also meeting international and national requirements and regulations. Such incentives are likely to provide a strong and equitable basis for stakeholder-engaged landscape governance in Vietnam when assisted by participatory methods of engagement (Hoang et al. 2013).

One way that potential market-based incentives can be constrained by pre-existing governance and economic arrangements is illustrated by the efforts of pastoral stakeholders in the Southern Rangelands of Australia to generate carbon-based income while reducing stock to encourage rangeland recovery. Uniform policies designed to support rangeland management across an entire region led to persistent degradation in particular landscapes and disincentives for investment in promising income-generating enterprises. Spatial analysis of economic, social and ecological patterns in the region demonstrates the potential income and associated rangeland recovery benefits that can be derived by reshaping policy to support the location-specific, special purpose entrepreneurial initiatives that are required (Safstrom and Waddell 2013).

Decoupling public subsidies from agricultural commodity production and attaching them to sustainable intensification methods and related environmental management measures in strategic locations, while theoretically promising, remains limited in practice and is still experimental. The approach exhibits high potential in scenario analyses in lowland England, however, for incentivizing vital grass-roots engagement in sustainable landscape governance particularly when linked with complementary policy mechanisms such as tax incentives, capital grants, codes of practice and others (Southern et al. 2011).

In the preceding three sections we have built a picture of the current knowledge on landscape governance practice through an understanding of how landscape governance is construed by researchers, policymakers and landscape actors, the contribution of science to governance design for multifunctional landscapes, the lessons and insights from practitioners through their innovations in analogous systems practice spaces, and finally through policy instruments that are fostering new spaces for applying policy in landscapes. From this body of knowledge, we propose a framework for the design of landscape governance.

Box 5 (continued)

previously used for extensive production (pasture) rather than into forested areas. Around the same time, the commodity market crash ***led to decreased profitability for soy and cattle, eliminating incentives*** *to expand farmland further into the forest. These policy and* ***market changes were accompanied by major governmental efforts*** *to monitor deforestation with real-time satellite data, and strict enforcement of anti-deforestation laws. Municipalities that failed to decrease deforestation were "blacklisted" by the federal government, resulting in sanctions, elimination of subsidies and restricted credit for producers in those municipalities (Macedo et al. 2012). Improving governance at landscape, state and national scales was successful in mitigating pressures from international markets, and transitioning and achieving multiple ecological and sustainable production and livelihoods outcomes in landscape performance.*

At least 35 other tropical countries face similar pressure to deforest *as a result of intensifying commodity production for international* ***export markets. However, only two of the 35 countries have comparable*** *governance in terms of the government's ability to formulate sound policies and the respect of citizens for governing institutions (DeFries 2013; Kaufmann 2010).*

6. A proposed framework for landscape governance design

Section 3 puts forth the idea that landscape governance is concerned with scale and multilevel governance arrangements that have a spatial dimension and are related to multiple networks of actors and their constellation. Landscape governance is about the decision-making concerning the landscape that occurs at these different scales, and among multiple actor networks. To aid in designing and facilitating effective landscape governance, it is useful to consider an 'actor-based' conception of an innovation system. Such a conception emphasizes the coordination of people and institutions with a stake in the outcome, and the learning that is required to bring about innovations they consider important (Checkland and Scholes 2001).

"To aid in designing and facilitating effective landscape governance, it is useful to consider an 'actor-based' conception of an innovation system."

A design framework that is rooted in innovation systems thinking includes five key components:

1. the desired practices to increase performance,
2. the actor constellation, i.e. the stakeholders involved and their relationships,
3. the values to which the actors aspire,
4. the processes to support the practice, and
5. the capacities for delivering the desirable practices through collaborative processes and based on multiple actor values.

The relationships and coordinating mechanisms of landscape governance systems are inherently diverse and subject to persistent change from internal and external sources (Sayer et al. 2013). Such changes include constantly shifting policy spaces in which actors form new rules and create new frameworks. A robust and adaptive system of innovation is needed, therefore, to enable multiple actor networks in landscape governance to coordinate and guide the complex interactions that are required to realize the desired performance outcomes (Buck and Scherr 2009). This role, often embedded in governance networks at multiple levels, is enabled through the development, selection and application of tools that help to foster innovation as well as integration within the system. Bridging organizations are likely to be particularly well suited to assume this facilitative role.

The elements in a robust and adaptive landscape governance system are encapsulated in the illustration found in Figure 1 (next page).

6.1 Performance

A well performing landscape governance system is comprised of institutional actors who work to foster synergy across multiple desired performance out-

Opposite: Dialogues between stakeholders, such as this one in Kenya, support landscape governance. Photo: Seth Shames/EcoAgriculture Partners.

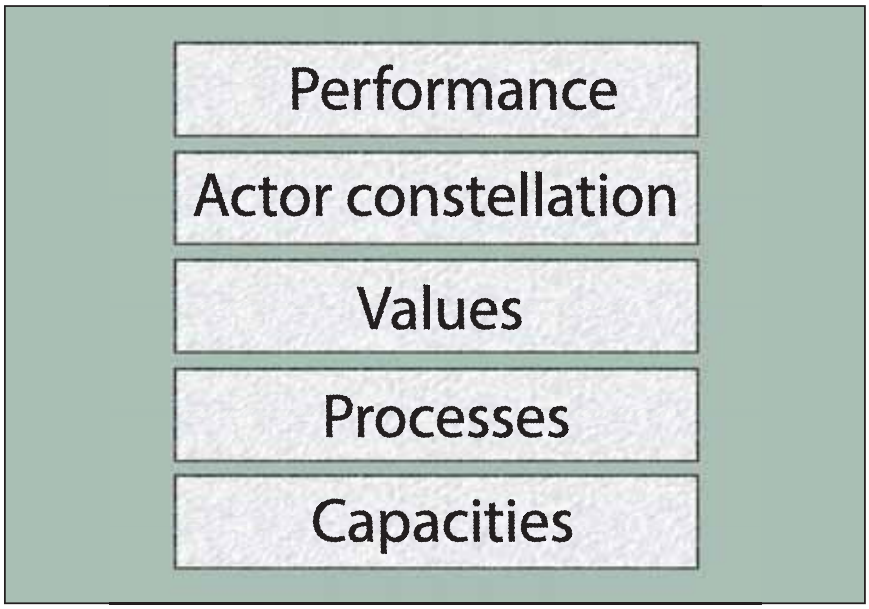


Figure 1. *Design frame for landscape governance*

comes. It enables the landscape to deliver a balance of conservation, production, livelihood and institutional outcomes.

The components of the landscape can be varied and include, for example, providing for local agriculture, water, culture, food and fiber needs while also conserving flows for external users. Diverse management systems can provide a set or series of ecosystem services that contribute to human well- being, but which do not result in the degradation of another service, such as clearing forest land for farming. The practice of landscape governance involves the coordinated development and use of planning and management frameworks and tools, guided by agreed values and aspirations of multiple actors that lead to collective decision-making and rules about sharing social and ecological assets in the landscape.

6.2 Actor constellation

A viable constellation of actors in landscape governance will exhibit arrangements that foster multiple performance outcomes across levels, such as networked, deliberative, or nested arrangements, and potentially encompassing levels from the local to global. Such a constellation is also likely to be characterized by diversity of actors organized within multiple actor networks. Governance networks are likely to promote flexibility, adaptation and innovation, and enhance collaboration and social learning among diverse knowledge

types. Authority and accountability are likely to be positioned for both balance of power dynamics and legitimacy among actors.

6.3 Values and aspirations

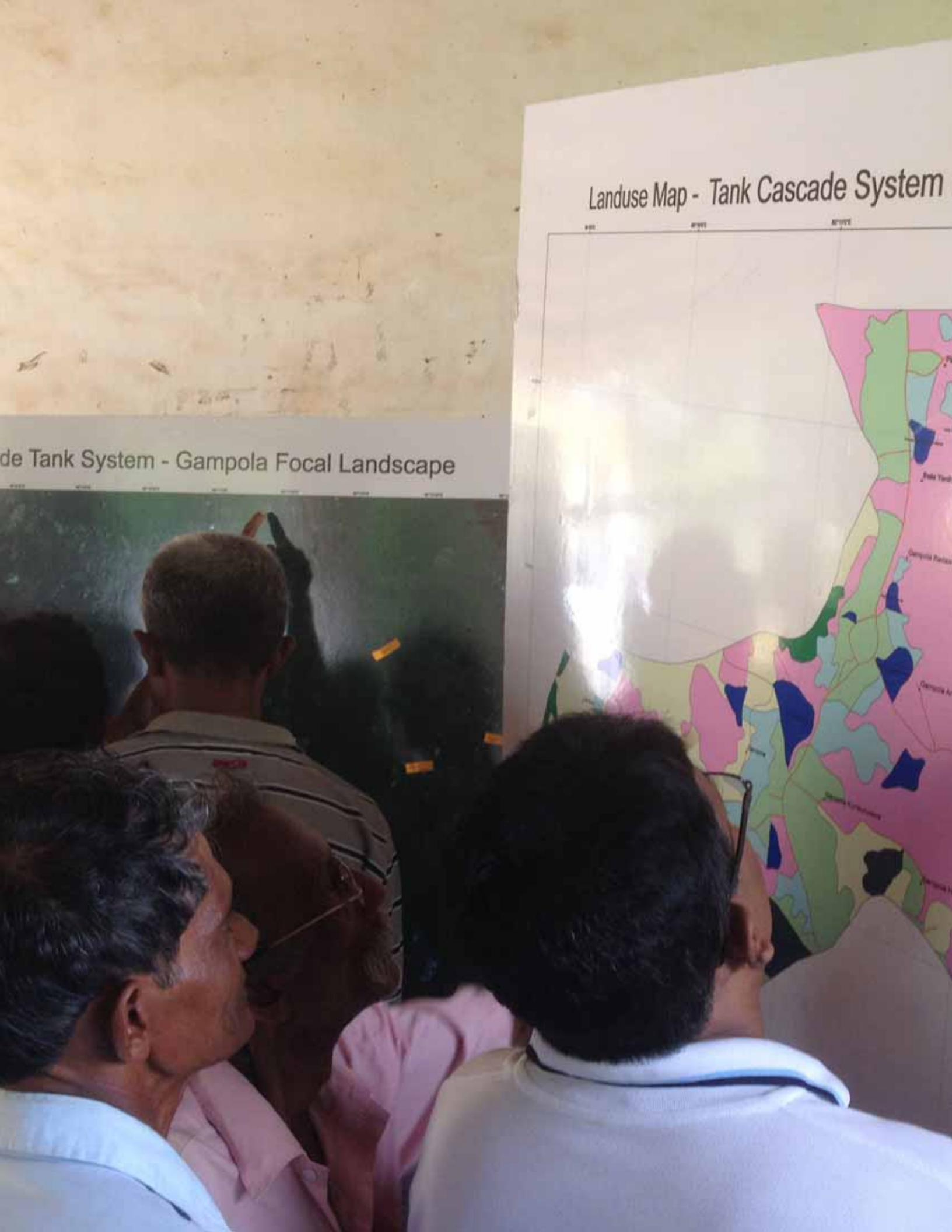
Values and aspirations represent the desired qualities and drivers of a landscape governance system. Values to which actors in landscape governance aspire include legitimacy, which ensures a sound cultural and legal foundation for the system; authority, which ensures that actors are empowered to decide and to act on behalf of all stakeholders and constituents; equitability, which ensures fair rules of participation, as well as perceptions of fairness in negotiations (FAO 2005); and sustainability, which ensures that the system is resilient and adaptive. A consideration in governance involves understanding the value frameworks which shape the deliberations of the institutions and actors involved in decision making, and their roles and relationships (Kooiman 2003).

6.4 Processes

Processes in a landscape governance system are ways of supporting practice and realizing aims through dialogue, decision-making, learning and knowledge sharing. Collaborative processes are required to foster the multi-scale, multi-jurisdictional coordinated action, democratic decision-making and adaptive management needed to stimulate the governance system to realize its multiple performance objectives. The co-design of governance systems is supported by the use of frameworks and tools that foster collaboration in learning and decision-making. Spatially explicit co-learning and planning tools are especially effective in addressing the challenges of bringing about multi-scale systems that work.

6.5 Capacities

Capacities in a landscape governance system provide the institutional know-how for cooperation in the various dimensions of landscape design, management and delivery of multiple performance outcomes. Capacities for cooperation in building effective landscape governance ideally will be distributed across institutional actors in relation to their functions in the system, though rarely are without concerted action. The development of capacities for co-learning and decision-making within arrangements of actors is required to help overcome power inequalities, capture valuable knowledge from multiple sources and make evident to stakeholders the values and qualities that will instill confidence that the system is legitimate and fair.


Landuse Map - Tank Cascade System
de Tank System - Gampola Focal Landscape

7. Towards more effective co-design of landscape governance

7.1 Assembling the building blocks of landscape governance systems

We have proposed a design frame for identifying the essential elements for co-design of effective landscape governance systems and reviewed insights that have emerged from analyzing practice in analogous management systems. We also have examined policy instruments that may be valuable building blocks in the co-design of landscape governance systems. Drawing on the elements of our design frame, this section proposes eight design specifications that emerge as important to the integration of the needed functions, structures, processes, qualities and capacities in a landscape governance system. We propose these strategies to help put into practice the viable elements of landscape governance systems identified in the design frame.

7.1.1 Choose arrangements that encourage innovation and learning

There is no single spatial arrangement or constellation of governance arrangements that constitutes a more favorable structure for landscape governance systems. Landscape governance arrangements span top-down to bottom-up, and formal to informal. Governance arrangements are best closely correlated to the location-specific characteristics of the landscape, but also the social, political, historical and cultural context of the landscape and nation (Janssen and Knippenberg 2012).

Governance arrangements in landscape governance systems may be diverse, yet emphasize those that offer the greatest opportunity to foster innovation and learning among actors through flexible arrangements. These arrangements typically include polycentric and adaptive networks that make use of adaptive co-learning processes to improve governance outcomes and may consist of various institutional arrangements among state, market and civil society actors that offer flexibility in delivering multiple outcomes (Penker 2009). These networked arrangements seek to balance various types of actors, and to foster horizontal and vertical connectivity, especially by seeking to integrate various sectors' entry points and approaches to landscape governance across scales (Elbakidze et al. 2010).

7.1.2 Foster complementary roles among state and non-state actors

As discussed above and in section 3, centralized mechanisms may benefit from complementary network mechanisms in the same landscape, which offers addi-

Opposite: Dialogue participants identify landscape benefits on a land use map in the Gampola Focal Landscape in Sri Lanka. Photo: Raffaela Kozar/ EcoAgriculture Partners.

"Governance networks can complement representative democracy by taking on certain functions and roles but should not function autonomously."

tional opportunities for flexibility and innovation. Governance networks can also provide a mechanism for an effective division of roles among state and non-state actors in the co-design of landscape governance systems.

Governance networks can complement representative democracy by taking on certain functions and roles but should not function autonomously (Hahn 2011). Common functions of governance networks focus on management responsibilities such as information collection and collating, deliberation and monitoring. They also include providing learning spaces to inform policymaking, innovation spaces to test new ideas, and deliberation spaces for continuous dialogue on desired performance outcomes, multifunctional uses, or incentives that are specific to the landscape (Hahn 2011; Penker 2009). This division of roles between state and non-state actors in governance networks can aid in establishing ownership by local users of the landscape through their leadership in developing management plans and formulating rules for the systems they are engaged in (Scott 2011; Knuppe and Pahl-Wostl 2013).

Governance networks can also complement representative democracy at the local level by creating spaces where deliberation may bring together traditional and customary governance processes with decentralized structures (Hahn 2011). They can complement policymaking by elected representatives by helping to define trends and identify adaptive solutions (Nagendra and Ostrom 2012). The performance of such management activities helps to legitimize the actions of public authorities. Specific organizational types within these networks, such as bridging organizations, take on additional complementary roles in facilitating the functions performed by the network among actors coming with diverse interests and agendas.

The role of central governments remains key even where an emphasis is placed on networked arrangements as a governance mechanism to foster innovation and learning. Evidence supports the role of governments not only in supervision and monitoring but in promoting and delivering actions for multifunctional landscape outcomes through their central position to various networks (Nagendra and Ostrom 2012). Design therefore should include a thorough understanding of existing institutions and their roles and functions to be performed. Finding coherence and complementarity among roles and functions of different types of actors is essential.

7.1.3 Distribute responsibilities, rights and authority among levels

As already established, a driving need for multi-level decision-making lies behind the impetus for more investment in co-design of effective landscape governance systems. As discussed in section 3, some evidence already suggests that complementarity is a key quality in the design of interactions among levels, as institutional arrangements in one spatial scale can impact others (Brondizio, Ostrom and Young 2009). Even more so, these interactions among levels are found to be more important drivers for decision-making than regulations or financial trans-

fers (Nagendra and Ostrom 2012). With this need for landscape governance systems to perform across levels, the design of governance arrangements and their spatial dimensions and constellation becomes an important element of how such systems will operate and facilitate multiple values, traditions and processes for landscape outcomes (Gorg 2007).

The distribution of power across scales and the degree to which actors and organizations are represented, as well as the mechanisms that facilitate their interaction, are key design elements that differ in each landscape governance system (Elbakidze et al. 2010). Landscape governance regimes are inherently structured upon polycentric governance arrangements to account for shared or distributed resource rights, multiple landscape components and multiple actors, scales and levels (Elbakidze et al. 2010; Penker 2009). Although arrangements will have a landscape-specific design, common characteristics include 'shared authority, responsibility and accountability' among a variety of actors (Janssen and Knippenberg 2012). The governance model embraces multiple actors and their knowledge systems as central to policymaking and management processes. The corresponding governance arrangements are reflective of distributed roles for providing knowledge among science and other non-state actors (Beunen and Opdam 2011).

An essential element of the co-design of landscape governance systems therefore is deciding who has authority and responsibility for what functions and landscape components, and distributing such responsibilities, rights and authority across multiple scales and actors in various types of governance mechanisms. In Box 6 (next page), the process of designing a system at national level and the challenges encountered in site-specific design and implementation are discussed.

7.1.4 Assign governance responsibilities to appropriate levels

To meet diverse performance outcomes through multilevel and multi-actor landscape governance, neither shifting responsibility solely to the local level nor placing responsibility only in increasingly higher spatial scales will be sufficient for addressing the complexity inherent in multifunctional landscapes (Brondizio, Ostrom, and Young 2009). Governance arrangements designed at any one level cannot in and of themselves adequately embody the principles, qualities, processes, and capacities for sustainability of multiple outcomes, nor the values important to the diverse actors engaged in the landscape (Brondizio, Ostrom, and Young 2009).

Governance arrangements need not be at the local or regional level as is often suggested. Ensuring governance arrangements are not automatically assigned to the local or regional level is an important consideration of co-design processes for landscape governance (Gorg 2007). As earlier noted in discussion of the trends in governance, processes of both localization and globalization of environmental governance are occurring simultaneously. Since multilevel design will be a core

Box 6. Spatialization of governance: learning from Cameroon and Switzerland

***The Technical Operations Unit (TOU) system in Cameroon was a pioneer** in large-scale, spatially-based governance systems. Through its successes and its shortcomings, the decade-long program can provide practitioners with valuable lessons for designing and implementing landscape governance systems.*

The forests of Cameroon are regarded as having considerable global, national and local biodiversity conservation value. They are, however, under increasing threat from agricultural expansion, timber extraction and the exploitation of resources such as bushmeat and other products of commercial value. To mitigate the loss of biodiversity and ensure that the provision of forest-based ecosystem services and the livelihoods of local people are not deleteriously compromised, the government of Cameroon, with the support of external donors, established the Forest Environment Sector Programme (FESP) in 2003. Its goal was to strengthen public and private efforts to achieve socially, economically, and ecologically sustainable use of national forest and wildlife resources.

Cognizant of the relative failure of focusing almost exclusively on protected areas and so-called "buffer zones" for rural development, FESP formalized a more inclusive and integrated landscape approach that enabled the formal management of priority areas for multiple uses and multiple benefits. Although there remained a focus on protected areas, there was also recognition of timber exploitation, community forestry and hunting as legal land uses in the 'zones' within each landscape. The TOU concept was created to ensure the adequate coordination of these seemingly conflicting land-uses. A TOU is defined as: "…a delimited geographical area, based on ecological, socio-economic, cultural and political characteristics for the enhancement of integrated landscape management involving all stakeholders."

***The primary advantage of the TOU process is to practice integrated** landscape management at the site level. This involves a multi-stakeholder management approach, focusing interventions on specific land uses while at the same time promoting a platform for societal dialogue between the managers of various land-use types.*

element of landscape governance systems, it will not be effective to assign all responsibilities to any one level (Brondizio, Ostrom and Young 2009).

In recent years, practitioners often have posited that the principle of subsidiarity should primarily prevail in governance arrangements, which are at tension with the need to remain open and flexible to the idea of multiple types of arrangements that may work. This emphasis on the principle of subsidiarity also tends to reinforce the idea of one level of government being the best single level to lead landscape governance, while ignoring the significance of polycentric arrangements to landscape governance for its ability to cross scales and levels (Nagendra and Ostrom 2012). Despite their key role in landscape governance, local decentralized governments are often not fully empowered to fulfill their mandated functions. Thus even if decentralized local governments had full capacities to undertake their mandated responsibilities, local governments alone would not be sufficiently robust, resilient and effective at one level for landscape governance systems to fully perform.

7.1.5 Ensure key roles for local governments

Local governments in decentralized nations are mandated to manage politically and administratively-delineated landscapes, and can use their power to foster cooperation. Yet there is paucity in capacity for integrated landscape management. Local governments therefore need primary attention if landscape governance structures, functions and processes are to be institutionalized. Local governments often are

inadequately represented in horizontal and vertical integration. It is essential to ensure they are adequately considered in design schemata for landscape governance systems.

7.1.6 Experiment and embrace complexity where needed

Traditionally, even in the face of such complex biophysical and social systems, emphasis has been placed on simple governance arrangements. More recent evidence supports the notion that complexity in social systems and ecosystems should match complexity in governance arrangements (Nagendra and Ostrom 2012). However, this notion is still contested among the science-practice network, as practitioners often aim for simplicity to ensure that governance arrangements are less complicated, are based on existing structures and minimize hierarchy. The new forms of governance and management we have presented in Section 3 (multi-level, network, adaptive, polycentric and other forms of new governance along with place-based co-management) inform various new ways of experimentation with complexity in landscape governance systems. More experimentation and experience with embracing complexity on the ground in governance arrangements should be part of moving towards more viable co-design of landscape governance systems.

7.1.7 Choose arrangements for various functions in a landscape

Governance of such complex systems may have specific governance mechanisms in different domains (e.g. state, market, non-state, hybrid or self-governance) for various biophysical compo-

Box 6 (continued)

Despite its advantages, the TOU process had difficulty achieving its *goals in such complex landscapes, due primarily to the power of external forces, such as economic development, to override local considerations.* ***Although many of the TOUs in Cameroon benefit from*** *external donor funding and technical support, weak governance structures and lack of capacity has hamstrung their implementation. In addition, the inability to achieve consensus among stakeholders through negotiation processes was prevalent, primarily due to inherently skewed power relations and competing interests.*

In comparison, spatially-based landscape governance in Switzerland ***offers other lessons for practitioners. Regional National Parks*** *(RNPs) were set up in late 2007 as a new instrument for nature conservation.* ***An RNP is defined as "a vast and less urbanized territory that distinguishes itself by a rich natural and cultural heritage…*** *It aims at (a) conserving and developing the quality of nature and landscapes, (b) reinforcing economic qualities, based on sustainable development, which are carried out in its territory, and fostering the marketing of goods and services that they produce" (Gerber and Knoepfel 2008).*

RNPs are oriented toward the entire resource rather than toward ***sectoral uses, with the landscape identified as a functional unit*** *beyond the borders of local authorities. Numerous actors had interests in the mountain landscapes of Switzerland, so RNPs attempted to align conservation, tourism and other priorities through coordination. RNPs are implemented in incoherent regulation regimes which* ***allow for conflicts among actors with opposing incentives. While*** *coordination can be improved through RNPs, they are stymied by* ***their lack of financial and planning control of relevant policies. They*** *also need to better integrate all relevant land users in RNP decision-making bodies.*

The TOU and RNP experiences offer examples of landscape governance *from which to learn, and upon which to build. Indeed, though the current discourse on landscape approaches is becoming increasingly mainstream,* ***the establishment of approaches like TOU and*** *RNP was ahead of its time in terms of providing legal and administrative frameworks for integrated landscape management.* ***Cameroon's TOU and Switzerland's RNP provide models to replicate,*** *improve upon, and scale up elsewhere.*

nents of a landscape (Nagendra and Ostrom 2012; Penker 2009). A key factor in the design of governance arrangements specific to landscape components should be inclusion of those actors with an interest in the governance of the ecological scales of the resources, which may also be nested (e.g., sub-catchment to catchment). Thereby, landscape-specific design of governance mechanisms and arrangements for varied resources and functions within the landscape should be an active part of the design strategy for a landscape.

7.1.8 Address issues of accountability and legitimacy

In co-designing landscape governance systems, it is important to get the balance right in the number and type of stakeholders in a governance network. Accountability must be maintained, yet the network must still be seen as legitimate in its ability to represent different types of actors (Hahn 2011). Defining the initial and changing roles of the network, and having various actors see these roles as legitimate, is also key to the design (Scott 2011).

Addressing accountability and legitimacy requires that governance arrangements ensure rights over resources at multiple levels, and that actors with responsibilities to manage also have the rights to do so. Mismatches at different scales must be avoided. The 'gatekeeper principle', as exhibited in Takamanda, Cameroon, is an interesting case study. The area is relatively ethnically homogenous, with a previously shared vision for landscape. Thus local people were able to control access and activities by outsiders, particularly in the harvest of high-value non-timber forest products (Sunderland et al. 2003) . This system broke down when conflict with National Park regulations, which came into effect in 2008, restricted their own access (Vliet 2010). But with poor enforcement of these controls, the bad feeling it created has led to uncontrolled access and over-exploitation not only of NTFPs but also bushmeat and timber, to supply the markets in neighbouring Nigeria. Once this local system of governance broke down, ironically aided by external conservation funding and 'expertise', forest exploitation, previously controlled by customary processes, became a free-for-all. In general, the co-design of landscape governance systems must create accountability mechanisms and rights at multiple levels.

While each of the foregoing eight strategies offer possible ways of working towards more viable co-design of landscape governance, a central issue to all design strategies remains overcoming power inequities and balancing power among actors.

7.2 Overcome power inequities among diverse actors

The challenge of power inequities among civil society, the private sector and other non-state actors engaged in multi-actor governance networks often threatens to derail landscape governance performance. While challenging and

sometimes uncomfortable to deal with, power relations are very real and must be researched, considered and understood. Internal power relations happen within communities and external power relations can influence an entire landscape. Some external examples include private sector industries representing mining or oil palm plantations. Thus social scales from household level to landscape to international must be considered in the analysis of influence on power dynamics within multilevel landscape governance systems. Power relations cannot be addressed simply at the local level; they need to be addressed at higher scales as well. Governance networks do not operate in ideal power vacuums but rather in real-life dynamic contexts in which practitioners themselves are part of distinct power relationships, regardless of their active participation or even knowledge of them.

Elite capture often is touted as one of the main ways that some groups of actors yield control over others. Elites are powerful participants in governance networks who are capable of mobilizing capital or resources to realize their own objectives (Wong 2010). Elites can come from local government, traditional ruling structures, powerful businesses, or other influential institutions. They may be from levels other than the level at which the resource is being managed. Elite actors may aim to skew resources toward themselves or toward their own ethnic, private sector, or political group. Numerous strategies have been utilized in different settings to combat elite capture, including exclusion, co-opting and discipline. In Bangladesh, a solar home system project identified local elites as a cause of poverty and deliberately excluded them from the decision-making process. Yet the people who participated in the project depended greatly on these elites for their livelihoods, and the project had difficulty moving forward without elite participation. Furthermore, local elites proved capable of influencing decisions even when excluded from the process (Wong 2010). In Ghana, a transboundary water governance project deliberately co-opted local elites into the program in an effort to include them. These elites helped enable the project effectively but also proved difficult to control once they were absorbed into the water committee (ibid.).

The establishment of disciplinary measures for unfair behavior can be useful, but it requires agreement among all stakeholders in formulating the measures and enforcing them. Much like with private sector actors, discipline of elites must be significant enough to discourage bad forms of behavior and participation, but not so significant that it discourages all participation. However, too much external attention on power inequities dismisses effective local institutions that have worked within the community for generations. Community-based governance that is locally defined and rooted in local history is likely to be a better form of checks and balances on elites than any form introduced by outsiders (Arnall et al. 2013). Still, practitioners need to be aware that customary systems that work well at one level may become distorted or break down when other scales and levels of governance are implicated. Thus, landscape leaders and practitioners

"Community-based governance that is locally defined and rooted in local history is likely to be a better form of checks and balances on elites than any form introduced by outsiders."

should proceed with caution in muddling through to what works in landscape governance systems.

In some cases, when participation is imposed upon multiple actors in the governance network by more influential actors (usually external or higher level actors), the result can be that participatory processes are co-opted to support the more influential voices to reinforce their own privileges. This phenomena has been termed the 'the tyranny of participation'. Civil society organizations (CSOs) can serve as a counterbalance to such dynamics where they have sufficient capacities or are strengthened to represent minority voices.

CSOs can play a variety of roles in governance networks to help overcome power inequities including support, representation or facilitation roles for particular groups' participation in the network. Most CSOs that participate in multi-stakeholder platforms do so with the express intent of representing or supporting under-represented groups, and therefore their participation in the network must be recognized as legitimate both by the under-represented group and other actors to ensure the benefits for these represented stakeholders (van Huijstee 2012). When not specifically representing particular interest, user, or minority groups, CSOs can serve as catalyst for the functionality of the network via financial resources, meeting facilitation, applications of tools and capacity building (Hiemstra 2012).

Mechanisms for implementing policies have the potential to help or hinder landscape governance in altering the balance of power between participating actors. Power imbalances can be particularly difficult to address at the local level alone. Legal frameworks and associated regulations can help to support more equitable dialogue processes, first by recognizing real power imbalances that exist between actors in the landscape and at larger scales, and second by creating opportunities for arbitration and compromise. Regulatory frameworks can be used to help balance power by protecting the rights of weaker actors and guiding or limiting the actions of powerful actors. Setting certain rules or by-laws within governance networks can also ensure some level of fairness in multi-actor proceedings.

Legal frameworks and regulations can support landscape governance by allowing for the creation of new governance structures or empowering existing ones. For example, they can be used to lay the foundation for engaging bridging organizations as third parties without vested interests to guide knowledge sharing and connect actors. Such organizations can help establish the rights and responsibilities of each of the actors, as well as who has power over resources and in what areas, and what benefits actors at all relevant scales are accruing from current management. Bridging organizations may be particularly useful in linking diverse land and resource user groups with elected officials and government committees.

Private sector participation is also crucial to the success of multilevel governance networks for landscape governance. Business interests, particularly in terms of

natural resources, can conflict with conservation or community development interests. But businesses are also important partners in linking local livelihoods to markets and spurring economic development (German et al. 2012). Incentives for private sector participation are important to make it attractive for companies to participate in a landscape governance network and potentially change the ways they operate. A recent report by the Landscapes for People, Food and Nature Initiative evaluated the risks and costs of business engagement in landscape approaches and found that partnerships are an important mechanism by which to mitigate shared risks among actors with common interests, develop a common vision among divergent actors, and leverage resources for collective management (Kissinger et al. 2013). Yet disciplining mechanisms are also important to hold companies accountable for decisions made through the network (van Huijstee 2012).

Private sector inclusion is multiplied when business associations participate in governance networks, as they offer increased market coverage. A grouping of business interests that is too large and diverse can limit decision-making and the ambition level of an initiative. An example is the Roundtable on Responsible Soy (RTRS), which allowed genetically modified soy to be covered by its certificate in order to include more large-scale producers and businesses in the RTRS. CSOs in the RTRS viewed this decision as a major sacrifice and a limit to the Roundtable's aspirations. More is not always merrier, so it is important to find a balance between a large number of business sector participants and a manageable initiative size that is capable of realizing ambitious targets (ibid.).

Civil society and private sector actors are important participants in governance networks. Working with each actor requires an understanding of their roles, interests, power and relationships within the landscape. Practitioners should also consider the proper timing and process for involving these types of actors. Inclusion that is too slow can lead to a loss of momentum and legitimacy, while involving all stakeholders too quickly and all at once can overwhelm participatory processes and related resources (IUCN Forest Conservation Programme 2012). Governance networks are not perfect entities, so continuing to find a balance of participation among private and civil sector actors as various functions within landscape dynamics change over time is crucial to advancing more effective landscape governance systems. Practitioners are challenged going forward to explore more ways within whole landscape governance systems to create 'generative forms' of power that pull actors together through collective action, rather than focusing on how to design systems that eliminate incentives or structures that allow influential interests or power imbalances to pervade over certain groups of actors (Hendricks 2009).

Having introduced a design frame and its elements in section 6 and strategies to operationalize co-design in this section, we turn now to exploring promising pathways and tools for advancing learning about landscape governance and its practice.

8. Promising pathways and tools for landscape governance

It is important to synchronize the different views, platforms, institutions and knowledge systems in the landscape to ensure some are not hidden or ignored, and that all are used to best achieve sustainable landscape management and equitable livelihoods of local people. Co-designing landscape governance systems is supported by the use of pathways and tools that foster collaboration in learning and decision-making. Pathways and tools for the co-design of landscape governance can be instrumental in these learning and decision-making processes by bringing together knowledge from science, policy and practice and helping to overcome information inequities among multiple types of actors.

8.1 Pathways for the co-design of landscape governance

The scarcity of well-defined implementation tools hampers the realization of multifunctional landscapes. Related to this issue is a lack of agreement on how to bring together social, cultural, economic and ecological views that are needed to implement landscape approaches (O'Farrell and Anderson, 2010). As there is no silver bullet method to deal with the complexity of designing governance systems for multi-functional landscapes, multiple methods are required at different phases of the pathway for implementing integrated landscape approaches in practice (Cowling et al. 2008). Such implementation pathways depend not only on different methods, but also on the involvement of different actors and their level of engagement. Figure 2 (next page) provides an example of such a pathway.

"The scarcity of well-defined implementation tools hampers the realization of multi-functional landscapes."

Highlighting the linkages between the methods and actors of sometimes fragmented communities should give an overview and guidance on collaborative processes in landscapes. Achieving true engagement in the pursuit of multifunctional landscapes requires the development of mutual learning, interacting and cooperation between researchers, land managers, various government and industry sectors and decision makers (O'Farrell and Anderson 2010; Scherr et al. in press).

Recognizing the urgency for meeting multiple sustainable development goals simultaneously, ICRAF and partners recently have designed and are testing a progressive mechanism for consistently improving decision making for long-term development returns on investments. The Support Hub for Evidence Based Decision Making (SHED) is a demand-driven engagement structure for co-learning among research, development and policy actors allowing for the

Opposite: Kandyan home garden system, Udukumbura, Sri Lanka. Photo: Raffaela Kozar/EcoAgriculture Partners.

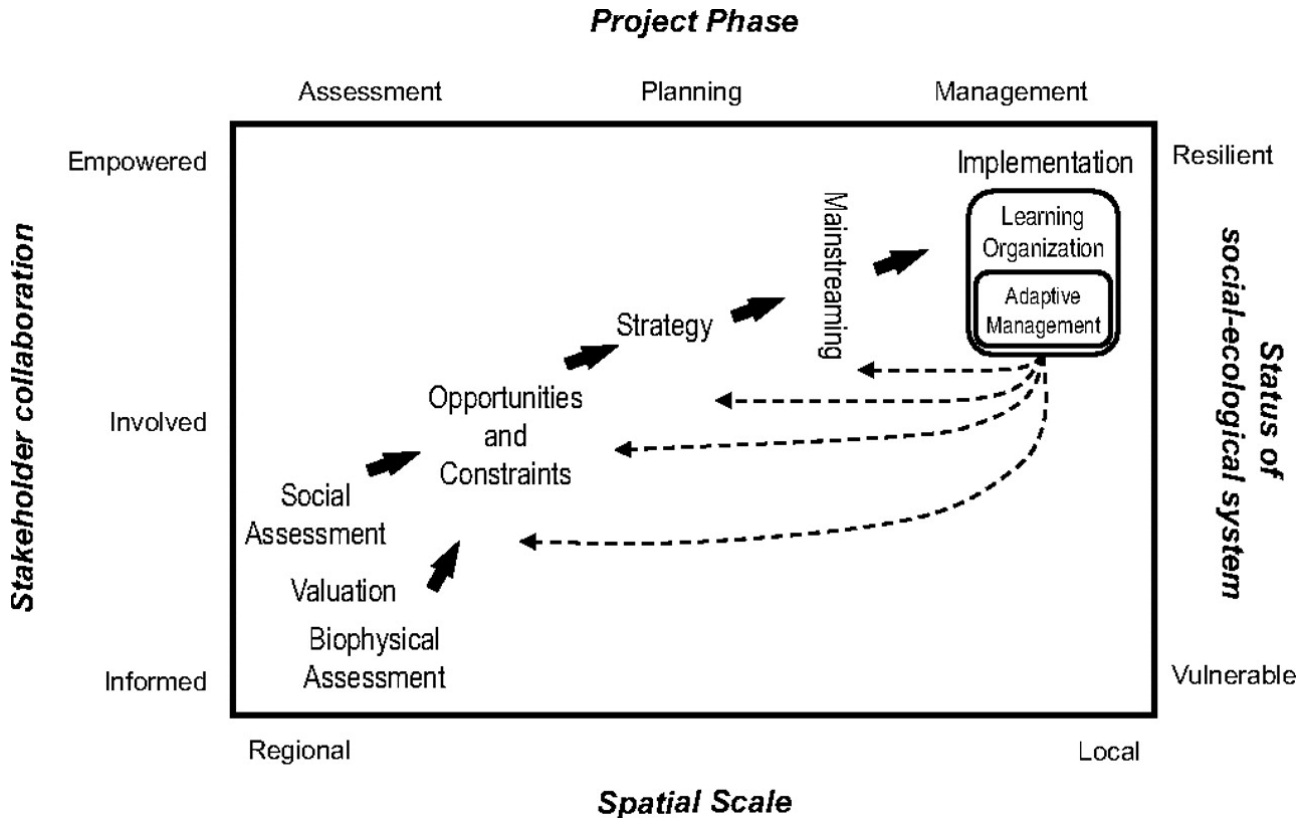


Figure 2. *Example of a pathway for implementing integrated landscape approaches in practice (Cowling et al. 2008)*

interrogation of evidence, biases and beliefs and the exploration and testing of alternate development trajectories to reach desired, agreed and clearly articulated resilience outcomes. Co-negotiations to determine implementation actions are thus based on a much stronger foundational understanding of implications of actions and necessary changes in behavior.

8.2 Tools to aid in overcoming information inequities

As discussed in section 4, different types of actors, including scientists, practitioners, technicians, policymakers and citizens, inevitably come to the table with their distinct forms of knowledge and information on landscapes, which may not be seen as equally valid, reliable or trustworthy by all parties. Different actors rely to varying extents on cultural, social, ecological, political or techni-

cally-based knowledge about one respective aspects or areas of the landscape. For instance, indigenous groups may have a strong tradition of eco-cultural knowledge at the landscape scale that scientists find difficult to recognize, while practitioners may be suspicious of scientific knowledge that has not been tested on the ground in real world circumstances.

Tools that can build common understanding and knowledge of landscapes by engaging various types of actors in the process help to create improved access to knowledge that is considered valid by all parties. The use of such tools in collaborative processes also improves stakeholder understanding of one another, their values, and the goods and services they desire from their landscape. Practitioners engaged in various analogous management systems have experience with testing and applying such tools that can be useful to landscape governance systems. In this section we provide an overview of the types of tools that can help generate insight for collaborative processes in landscape governance, and discuss how their use may contribute to overcoming power inequities among multiple actors at different scales. Annex 2 provides a list of the tools that contributed to this overview, drawing on tools found in the literature on analogous systems as well as tools contributed by our expert panel on emerging insights from analogous systems practice.

8.2.1 Five types of landscape tools

A wide variety of tools are available to practitioners for increasing different types of actors' engagement in landscape governance, particularly for reducing imbalances of knowledge and power that have traditionally limited the contributions of local actors to landscape level governance decisions. Here we highlight five groups of tools that lend to these objectives at various stages of collaborative management. These are tools for

1. understanding,
2. visioning,
3. deliberation,
4. decision-making, and
5. monitoring and evaluation.

Finally, some tools transcend the above categories and can aid actors in overcoming information inequities throughout multiple stages of landscape management. Box 7 (next page), describes a spatially explicit tool for co-learning and planning that is especially effective in addressing the challenges of bringing about multi-scale systems that work and that can support multiple actors at various stages of collaborative processes.

Box 7. Linking people with their landscapes through a planning and monitoring guide

The Guide to Spatial Planning and Monitoring of Landscape Interventions: Maps to Link People with Their Landscapes, developed by EcoAgriculture Partners, is designed to stimulate cross-sectoral collaboration in locating, designing, and monitoring interventions in rural landscapes. It encompasses seven steps to guide a carefully selected group of key stakeholders through landscape planning processes aiming at agricultural production, biodiversity conservation and livelihood security outcomes. The planning and monitoring guide uses the best available maps to facilitate discussion ***by allowing stakeholders to specifically indicate areas where landscape benefits should be planned. The use of a wide range of maps (such as maps on water flows, suitable agricultural soils, vegetation*** *cover and population) also supports the planning for well-informed placed-based changes, of which the desired impact often depends on the spatial characteristics of a larger area.*

Tools for understanding

Tools to aid understanding help stakeholder groups identify how their landscape is performing, and can also help to establish knowledge and understanding of key aspects of the landscape that may be important for garnering the support or interest of actors at other scales. Tools for understanding include a wide variety of diagnostic tools for assessing everything from stakeholder networks and power relationships to the cultural, ecological and social values of different parts of the landscape. They facilitate reliable, respected and accessible information for all stakeholders, an important first step toward establishing a common vision for the landscape and its management. The Landscape Performance Scorecard created by EcoAgriculture Partners is an example of a tool that helps stakeholder groups quickly identify how their landscape is performing along key dimensions of landscape performance, while also generating insight that can be easily communicated to others (www.landscapemeasures.info).

Tools for visioning

Tools for visioning help stakeholders apply their knowledge in developing informed and creative visions for their landscape, while giving the values and objectives of each stakeholder equal standing. Visioning tools focus on helping stakeholders identify their values and objectives for the landscape and how those objectives could be achieved either through place-specific management interventions or through the establishment of new institutional or policy mechanisms to facilitate collabo-

ration. These tools also help stakeholders communicate their objectives with one another and identify opportunities for potential synergies or trade-offs. Valuation exercises, mapping and dialogue are common elements of many visioning tools. The Landscape Game developed by CIFOR is an example of a creative tool that helps stakeholders think about different objectives, goals and concepts related to landscape management (Purnomo et al. 2009). Visioning tools help stakeholders move beyond apparent differences or shared values to explore relationships among stakeholder values and objectives across an entire landscape, often uncovering unexpected or new opportunities for collaboration or pitfalls to avoid in the coming stages.

Tools for deliberation

Negotiating competing objectives for land management and governance between actors at multiple scales can be extremely challenging, especially when differentials of power and knowledge prevail. Fortunately, there is a wide variety of tools to aid dialogue and deliberation around objectives (FAO 2013). These tools are sensitive to power imbalances and seek to establish structures and settings where such imbalances are minimized. Some deliberation tools focus on negotiating objectives between local stakeholder groups, while others support dialogue between stakeholders across spatial and political scales. Dialogue can be challenging to facilitate, and entirely necessary in landscape governance processes for arriving at legitimate, relevant, and authoritative decisions about land use. ICRAF's Southeast Asia

Box 7 (continued)

Figure 3 (below) illustrates the seven linked steps. In step 1, stakeholders share thoughts and identify locations that supply important ***landscape benefits, such as water regulation, crop production, habitat*** *provision and moderation of extreme climate events. In step 2, stakeholders share ideas and identify areas where changes leading* ***to improved landscape benefits flows are desired. In step 3, stakeholders*** *identify the current governance actors for these areas. The* ***planning tool also has a specific monitoring step that requires stakeholders to carefully describe landscape benefits in a measurable way (step 4). Based on the specified landscape benefits and selected*** *areas where changes are desired, stakeholders jointly discuss how* ***a potential change in the landscape will affect different landscape benefit flows and beneficiary groups (step 5). After consensus is re***searched in step 6, stakeholders plan for a preferred change in the landscape using a range of maps and involving relevant governance actors. Step 7 guides stakeholders in setting up a strategy to monitor ***and evaluate changes in benefits flows after implementation of the*** planned intervention. Stakeholders also discuss how to make their landscape planning adaptive to possible future change.

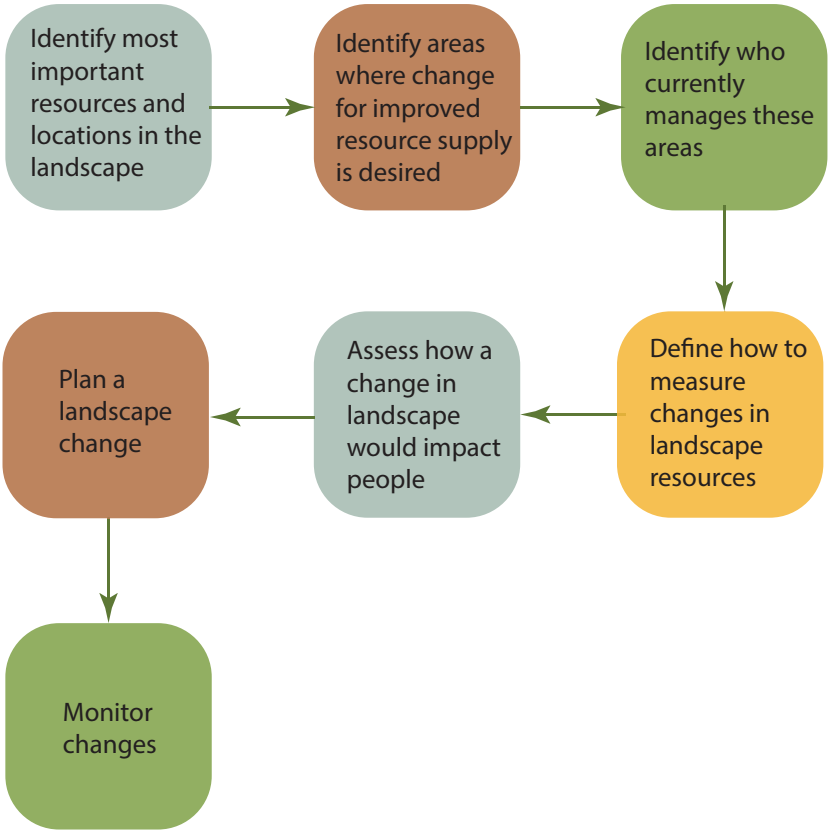


Figure 3. *Seven linked steps in the Guide to Spatial Planning and Monitoring of Landscape Interventions: Maps to Link People with Their Landscapes*

Regional Program has developed a negotiation-support toolkit for learning landscapes which incorporates the types of deliberation tools described above, including methods, approaches and models (Van Noordwijk et al. 2013).

Tools for decision-making

Even after stakeholders reach agreement on objectives, there are often different management pathways for achieving those objectives. Decision-making tools are closely linked to the deliberation tools. These tools support stakeholder decision-making processes based on the set of objectives negotiated by stakeholders. They help stakeholders explore options and arrive at a plan for implementing a change in their landscape. The most common type of decision-making tools are scenario building tools that depict or describe the outcomes of different management or policy decisions. By anticipating the outcomes, stakeholders are able to make informed decisions, taking into account the benefits and risks of a proposed change. Decision-making tools range from the simple to the very complex. For tools requiring a high level of technical expertise it may be necessary to translate the results into formats that are meaningful, understandable and trusted by all stakeholders. For simple tools, it may be important to establish the rigor and creditability of the tool with stakeholders who expect robust decision-making tools.

Tools for monitoring and evaluation

The final set of tools is for implementing and monitoring outcomes of a management action or policy. These tools involve stakeholders in identifying indicators and means of measure to track performance on their objectives. They serve a wide range of uses, from monitoring progress toward designated goals and verifying expected outcomes, to the continued strengthening of stakeholder knowledge to participate in landscape governance systems. Ultimately, these tools facilitate the ongoing awareness of key landscape dimensions and changes related to the interests of stakeholders. Beyond evaluating actions, monitoring tools can also build knowledge and understanding, to support ongoing visioning, dialogue and decision-making within landscape governance systems. One example, the assessment framework for evaluating governance systems for landscape-level ecosystem-based management (LLEBM), was developed by the International Livestock Research Institute in partnership with Vancouver Island University, Conservation Knowledge and the University of Victoria. This tool is helpful for giving stakeholders, funders and policy-makers a coherent synthesis of the state of governance for landscape management (Robinson et al. 2012).

9. Conclusions

Land and resource scarcity and the degradation of natural resources are colliding with societal aspirations for poverty reduction, livelihood security and human well-being throughout the world while agricultural land use dramatically expands and climate change taxes the resilience of communities and ecosystems. Integrated landscape approaches to addressing the 'wicked problems' that often lie at the nexus of these socio-ecological challenges are rapidly gaining the attention of investors, international development programs and policy makers, and thereby exposing the challenges in bringing about viable systems of landscape governance. Building governance systems that include diverse public, private and civic sector stakeholders and multiple levels of jurisdiction for decision-making in the governance of complex landscapes requires new ways of thinking and new practice. This working paper attempts to capture current knowledge about paramount challenges, strategies and innovations that characterize pursuits to make landscape governance work, and thereby contribute to bringing about the new thinking and practice that is needed. The effort leads us to the following four conclusions.

To foster cooperation across multiple functions, levels and jurisdictions, multi-sectoral cooperation frameworks were found to be critical elements of landscape governance. They may be essential instruments in aiding the cooperative aspect of the 'co-design' of landscape governance systems. They are particularly well suited to aid in the integration of various forms of knowledge from across the science-policy-practice network and are important for enabling further work in the development of principles and guidelines for multiple actors. Cooperation frameworks have the potential to link levels from the local to the global and have the advantage to work at multiple levels, and promote integration both horizontally and vertically. Multi-sectoral cooperation frameworks should be designed to bring together various sectors, and also recognize the key role of local governments.

We learned that the dominant governance mechanism that practitioners begin within, spanning the centralized to more inclusive of other actors, is a less important determinant of the performance of robust institutions for landscape governance than the design of institutional arrangements and interactions among levels of governance. We therefore emphasize the lessons brought forth as principles, processes, institutional arrangements, integration mechanisms, and knowledge systems as important building blocks to support landscape actors and practitioners in moving towards viable co-design of landscape governance.

"Building governance systems that include diverse public, private and civic sector stakeholders and multiple levels of jurisdiction for decision-making in the governance of complex landscapes requires new ways of thinking and new practice."

We have posited that the rich knowledge embedded in experience with customary governance arrangements offers a base to draw upon in designing arrangements that work in landscape governance systems. To take these lessons forward landscape actors and practitioners will need to consider how these arrangements must be adapted in designs that consider the changing ecological and social scales brought about by new demands and new actors engaged with the landscape.

Finally, this paper has begun to identify pathways towards designing viable landscape governance systems. Investment in developing capacities for the co-design of landscape governance systems stands to further accelerate the learning and practice. Well designed, cross-sectoral capacity development initiatives should be instrumental in bringing about the new thinking that is needed to creatively explore these pathways for collaborative learning and decision-making that will lead to robust, effective and sustainable performance of landscape governance systems.

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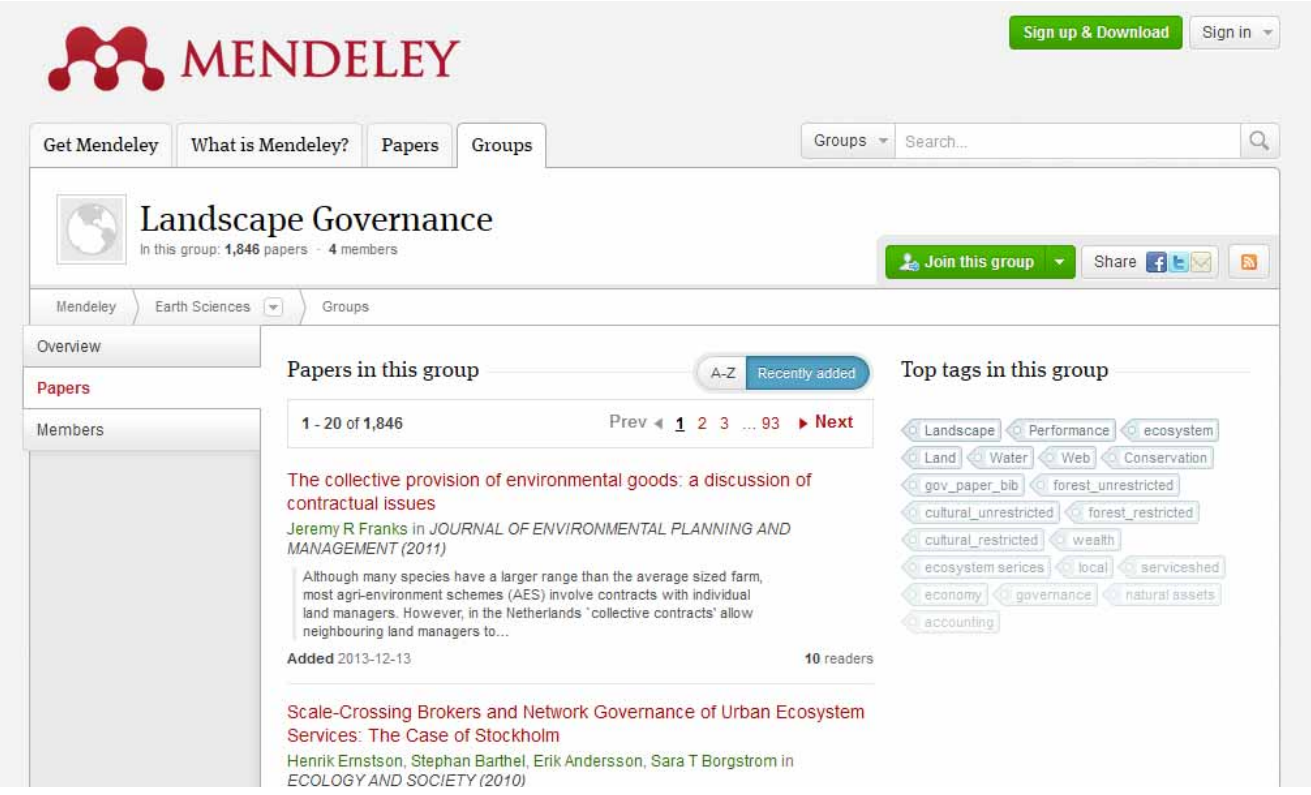
Annex 1. Using Mendeley Groups for organizing and sharing literature on landscape governance

Mendeley is an open-access online resource for managing literature (www.mendeley.com). It can be used as a traditional citation management software to organize and annotate references, and create bibliographies. However, Mendeley also functions like online social networking applications in that it allows you to create groups in which members can share literature with one another or the public.

For this review, we used Mendeley Groups to create a database of references on key literature related to landscape governance. Using the search histories for the literature review, we created folders for literature related to each of the groups of analogous systems discussed in the paper, as well as innovations and policy frameworks for landscape governance. The Landscape Governance group is open to the public. You can follow the group and access the list of references gathered in our search for the most relevant pieces on landscape governance at http://mnd.ly/1ebzZYu.



A screenshot of the Landscape Governance Group on Mendeley.

Annex 2. Summary of Global Landscapes Forum Technical Session on Landscape Governance

The authors organized a technical and networking session on November 16, 2013 on behalf of the global Landscapes for People, Food and Nature (LPFN) Initiative at the Global Landscapes Forum (GLF) entitled Exploring governance strategies for integrated landscape management to which they invited selected experts to form a panel. Panelists comprised landscape practitioners and researchers from Bioversity International, the Center for International Forestry Research (CIFOR), the World Conservation Union (IUCN), the UN Food and Agriculture Organization (FAO) and the World Agroforestry Center (ICRAF). Panelists were provided with a challenge statement and key questions about landscape governance that were designed to elicit their expert experience related to ingredients for effective landscape governance. A 'round robin' format enabled panelists to reflect on one another's comments in refining their own. A recorder documented the session.

The following provides information on the sponsors of the session, the challenge statement and key questions that formed the basis of discussion at the GLF, and the names and organizations of panelists and moderators who participated in the session.

Session Sponsors

The session was sponsored by the following Landscapes for People, Food and Nature Initiative (LPFN) co-organizers: Bioversity International; Conservation International; the Dutch Ministry of Economic Affairs, Agriculture and Innovation; EcoAgriculture Partners; Food and Agriculture Organization of the United Nations, International Fund for Agricultural Development, United Nations Environment Programme, World Agroforestry Centre (ICRAF), and World Resources Institute.

Challenge Statement and Key Questions: Toward Effective Landscape Governance

Multi-stakeholder platforms and networks are emerging through which public, private and civic sector institutions pursue their respective goals, commonly in the context of dispersed and limited authority for landscape level planning and management. The complex process of moving towards viable governance systems for multi-stakeholder management of agriculture and natural resources at landscape scales commonly is fraught with difficulty, and the pursuit of mul-

tilevel and multi-actor decision-making remains elusive. The many challenges associated with designing multilevel and multi-stakeholder governance systems include:

1. Establishing collective goals and building common understanding across different types of authorities,
2. Reconciling and incorporating a broad range of multifaceted values and perspectives held by diverse stakeholders,
3. Addressing power inequities in multi-stakeholder decision-making processes,
4. Deciding on who has rights to participate in management decisions and to decide upon boundaries,
5. Dealing with the complexity of multiple levels, actors, and functions,
6. Understanding the constitution of various spatial levels and their relationship with one another, and
7. Transitioning to more integrated systems and mechanisms.

Joint learning and integration is needed to manage complex landscapes, which commonly span multiple jurisdictions. Innovation and experimentation is occurring in multiple analogous management systems including water, forest, land and natural resource, biodiversity, ecosystem and cultural landscape management. These innovations and experimentation are leading to a variety of innovative institutional arrangements for aligning the efforts and priorities of multiple actors in the pursuit of diverse objectives. To scale up promising landscape initiatives and expand the integrated landscape approach, attention to lessons that experts and practitioners are learning from their experiments in these diverse management systems is warranted. Landscape governance is concerned with the institutional arrangements, decision-making processes, and administrative and regulatory frameworks by which multiple stakeholders pursue their interests in sustainable food production, biodiversity and ecosystem service conservation, and livelihood security in multifunctional land and resource management systems. To accelerate learning about landscape governance and explore the potential for distilling insight about effective practice into models for collaborative design of viable systems, our experienced panelists will address the following key questions:

1. What experience with the principles, design factors and mechanisms of analogous management systems can you draw on to illustrate what works? What notable characteristics of the system(s) appear to contribute to their viability?
2. What are vital ingredients in building the institutional infrastructure for landscape governance systems that are adequately legitimate, authorita-

tive, equitable and sustainable for supporting integrated landscape management?

3. What strategies, methods and tools would you suggest may be particularly useful in helping to design multi-level and multi-stakeholder landscape governance systems?

Panelists

Edmund Barrow, Head, Global Ecosystem Management Programme, IUCN

Sally Bunning, Senior Officer, Land and Water Division, FAO

Delia C. Catacutan, Senior Social Scientist, Country Representative, and Gender Program Coordinator of the World Agroforestry Centre (ICRAF), Vietnam

Terry Sunderland, Principal Scientist, Forests and Livelihoods Programme, CIFOR

Anne Tutweiler, Director General, Bioversity International

Moderators

Raffaela Kozar, Senior Manager, EcoAgriculture Partners

Sara Scherr, President, EcoAgriculture Partners

Recorder

Rachel Friedman, Program Associate and Blogger, EcoAgriculture Partners

Annex 3. Summary of Integrated Landscape Research Forum

On October 2013, an Integrated Landscapes Research Forum (ILRF) was held at Cornell University in Ithaca, NY, USA, that brought together faculty from diverse disciplines and departments to consider how framing conservation and sustainable development issues from a landscape perspective might stimulate insight into the design and interpretation of relevant research. The half-day meeting drew 30 researchers to discuss ways that socio-ecological landscape approaches to understanding complex problems and opportunities at the interface of ecosystem conservation, sustainable agricultural production, livelihood security and multi-stakeholder governance can aid in designing and scaling up strategies to address them. Following a plenary session on landscapes led by conservation scientist Jeffrey McNeely, A.D. White Professor at Large at Cornell University, and Dr. Christine Negra, Director of Research at EcoAgriculture Partners, faculty organized into discussion groups, one of which focused on hte topic of managing and governing multi-stakeholder integrated landscape management systems

Problem statement

Effective management of integrated landscapes requires cooperation among stakeholders from diverse sectors and by decision-making authorities with varying mandates at different scales. Yet existing institutions and governance structures often reinforce sectoral foci, and provide little capacity to link local, landscape, and national actions to capture synergies among agriculture, environment and livelihood goals. While innovative ways to overcome challenges confronted in landscape governance are beginning to emerge, opportunities to share knowledge and accelerate learning about these complex systems have been few.

We would like to explore conditions for and requirements of landscape management and governance systems that are adequately legitimate, authoritative, equitable and sustainable.

1. What examples of innovative multi-stakeholder management and governance systems do we know about? What conditions are needed for such systems to emerge?
2. What allows them to become and remain effective?
3. What constraints prevent this type of system for readily arising?
4. Are there important ways that integrated management and governance systems will need to adapt to meet changing needs?
5. How might we study these questions?

Annex 4. List of tools to support landscape governance systems

Tool developer	*Tool*	*Source*
ALTERRA	Evaluation tool for developing strategic plans for the development of agriculture to increase food security	http://content.alterra.wur.nl/Webdocs/PDFFiles/Alterrarapporten/AlterraRapport2352.pdf
Arizona State University	Using social network analysis to manage conflicts	Munoz-Erickson et al., 2010
BC3 et al.	Rapid ecosystem service assessment and valuation (ESAV) for eight ecosystem services	http://www.ariesonline.org/
Birmingham City University	Focus groups for land use policy and planning	Scott, 2011
Cambridge Conservation Initiative & birdLife	Practical guidance for measuring ecosystem services at the site scale and effectively communicating the results	http://www.conservation.cam.ac.uk/resource/document/resource-3
CIFOR	Visioning tools (STELLA) for optimizing conservation and development outcomes; 5 natural capitals scoring	http://www.cifor.org/conservation/publications/pdf_files/Vietnam%20workshop%20summary%20final.pdf
CIFOR	Spatial analysis of swidden landscapes over time for MRV for REDD+	http://www.cifor.org/online-library/browse/view-publication/publication/3491.html
CIFOR	Multidisciplinary Landscape Assessment methods	http://www.cifor.org/publications/pdf_files/Books/BLiswanti0901.pdf
CIFOR	Historical trends analysis and scenario visioning	http://www.cifor.org/conservation/_ref/research/research.3.1.htm
CIFOR	Participatory mapping and drawing of "rich pictures"	http://www.cifor.org/conservation/_ref/research/research.3.2.htm
CIFOR, IRD, University of Queensland	Land use planning assessment tools (comparing planning objectives with achievements)	Bourgoin et al., 2012

Tool developer	*Tool*	*Source*
CIFOR, IRD, University of Queensland	Role-playing games	Bourgoin et al., 2012
CIFOR, IRD, University of Queensland	Participatory 3D modeling	Bourgoin et al., 2012
CIFOR, IRD, University of Queensland	Socio-economic and environmental impact assessment	Bourgoin et al., 2012
CIMV, Ecole Polytech	Technology screening tools to apply multidisciplinary criteria by stakeholder panels (design tool)	Cohen & Stuart, 2012
Cooperazione e Sviluppo (CESVI), The Mountain Institute	Participatory scenario planning for dealing with long-term uncertainty and complexity	Daconto & Sherpa, 2010
CSIRO	A practical framework for developing sustainable land use scenarios that has direct policy relevance	http://www.sciencedirect.com/science/article/pii/S016920461000037X
CSIRO, University of Aveiro	Social-ecological planning framework	Bohnet, 2010
CTA, IFAD	Training material for mapping methods	http://pgis-tk-en.cta.int/info/curriculum.html
EcoAgriculture Partners, Cornell University	Landscape Measures Resource Center contains a variety of tools for developing indicators and means of measure for multiple dimensions of landscape management	http://landscapemeasures.info
Ecole Polytechnique Fédérale de Lausanne	SMURF is mainly intended to accompany collaborative or participatory strategic planning approaches.	http://www.sciencedirect.com/science/article/pii/S0198971505000402
ESPA et al.	Identify tradeoffs a) between different ecosystem services and b) between the wellbeing of different stakeholders resulting from policy and development scenarios and changes in ecosystem services	http://www.espa.ac.uk/projects/ne-i00324x-1/further-information-and-project-documents
ETH	Visualization tool to determine public preference	http://lrg.ethz.ch/visulands/fs_visulands.html
EU-DESIRE project	Spatial assessment based on land use systems identifies the status and trends of degradation and SLM, including causes, drivers and impacts on ecosystem services	http://onlinelibrary.wiley.com/doi/10.1002/ldr.1040/abstract
Finnish Environmental Institute	Agrienvironment regulation schemes	Arponen et al., 2013
Finnish Environmental Institute	Spatial conservation planning tools / zonation software	Arponen et al., 2013

Tool developer	*Tool*	*Source*
GIZ (Deutsche Gesellschaft für Internationale Zusammenarbeit)	Recognise the links between nature and development, consider the trade-offs associated with development plans, and incorporate ecosystem service-related opportunities and risks into their development strategies	http://www.ecosystemassessments.net/resources/tools-and-publications.html
ICRAF (World Agroforestry Centre)	Online databases of appropriate species for planting	http://www.slideshare.net/ICRAF_PRESA/pes-tools-from-icraf-presentation
ICRAF (World Agroforestry Centre)	PRESA - Rapid analysis tools for landscape, hydrology, biodiversity, land use change, poverty-livelihoods-environment dynamics, and carbon stocks	http://www.slideshare.net/ICRAF_PRESA/pes-tools-from-icraf-presentation
ICRAF (World Agroforestry Centre)	LUWES (Land Use Planning for Low Emissions Development Strategy) for negotiating the development of land use plans; includes Rapid Land Tenure Assesssment, Rapid Carbon Stock Appraisal, and REDD Site Feasibility Appraisal	http://www.asb.cgiar.org/PDFwebdocs/LUWES%202012%20V1.pdf
International Union for Conservation of Nature	Structured analytical process for assessing progress toward sustainability. The IUCN Sustainability Assessment Method measures both human and ecosystem wellbeing and gives them equal importance.	http://cmsdata.iucn.org/downloads/resource_kit_a_eng.pdf
Korea Environment Institute, Suwon Research Institute, Seoul National University	Revising Environmental Impact Assessment as a tool for integrated approaches to impact assessment (for assessing impacts of development on multiple scales)	Kim, Song & Lee, 2013
KTH-International Groundwater Arsenic Research Group	Effectively and efficiently planning for arsenic (As) mitigation activities	http://www.tandfonline.com/doi/df/10.1080/10934520701567221
Landcare Research, Cawthron Institute	GIS for documenting cultural, heritage and achaeological sites and cultural values	Munguia et al., 2009
Landcare Research, Cawthron Institute	Combining agent-based modelling with GIS for Land Use-Land Change simulations	Munguia et al., 2009
Michigan State University	Process-based watershed models	Shen & Phanikumar, 2010
Millennium Ecosystem Assessment	"How to" guide for undertaking ecosystem assessments for decision-making	http://www.ecosystemassessments.net/resources/tools-and-publications.html

Tool developer	*Tool*	*Source*
Natural Capital Project	Tool to estimate the amount and value of environmental services that are provided on the current landscape or under future scenarios	http://www.naturalcapitalproject.org/InVEST.html#How
Natural Capital Project	Aims to determine where new water funds should be developed? and where and in what each water fund should invest its money	http://www.naturalcapitalproject.org/rios_download.html
Nature Conservancy	Evaluating land purchase/acquisition for achieving maximum return on investment in terms of overall contribution to a country's conservation goals	http://maps.usm.edu/pat/index.html
Prognostický ústav SAV	Complex environmental valuation for decision-making processes	Kluvankova, 1998
RECOFTC	Conflict mediation tools to minimize negative impacts of forest conflicts	http://www.recoftc.org/site/uploads/content/pdf/confilct%20research_2_263.pdf
RMIT University	Reserve design tools to identify sites and calculate trade-offs between objectives	Bekessy et al., 2012
Stairs Studio	Easy tool for drawing on Google maps and exporting layers	http://www.scribblemaps.com/
Stockholm Resilience Centre, National Center for Ecological Analysis and Synthesis, Arizona State University	Framework for conceptualizing and measuring learning to support natural resource governance	Crona & Parker, 2012
Swedish University of Agricultural Science	Rapid assessment tool for certification impacts on biodiversity	Elbakidze et al., 2011
Swedish University of Agricultural Science	Approach for including place-specific values in MCDA-based participatory forest planning	http://www.metla.fi/silvafennica/full/sf45/sf452253.pdf
Taiwan eGovernance Research Center, National Cheng Kung University	Web 2.0 applications as a tool for enhancing interactive collaboration and public participation	Pan & Chiang, 2011
Texas A&M, Indian Institute of Technology, Tarrant Region Water District	Sensitivity analysis for modeling best management practices	Lee et al., 2010
United Nations Environment Programme	Tool that evaluates methodologies for valuing ecosystem regulating services in economic terms and shows how to incorporate these values into decision-making processes	http://www.unep.org/pdf/Guidance_Manual_for_the_Regulating_Services.pdf

Tool developer	*Tool*	*Source*
United States Department of Agriculture, Virginia Tech	Hydrologic landscape regions / physiographic provinces as predictive tools	McManamay, 2012
United States National Oceanic and Atmospheric Administration, Carnegie Mellon University, U.S. Environmental Protection Agency, Neptune and Company, Inc.	Drivers-Pressures-States-Impacts-Responses analysis for landscape decision-making	Rehr et al., 2012
Universidade dos Açores	Coastal Zone Management Plans as tools for policy implementation in Portugal	Calado & Quintela, 2007
Universidade Técnica de Lisboa	Tool for assessing linkages between human well-being and ecosystem services at the local level, as perceived by the community	http://www.ecologyandsociety.org/vol10/iss2/
University of Adelaide, Sorbonne University	Classification tools for land use planning	Bardsley & Pech, 2012
University of Brighton, National Institute of Design, Dare	Mobile applications for storytelling (similar to Conservation Bridge)	Roibas et al., 2007
University of Illinois	Communication tool for neighborhood and community assessment, via their description, evaluation, or prescription for their local environment	http://www.tandfonline.com/doi/df/10.1080/01944360008976107
University of Kwazulu-Natal	Mechanism for identifying potential estuary-based enterprises that consider resource conservation and the dependence of human wellbeing on natural capital	http://www.ecologyandsociety.org/vol17/iss3/art15/
University of Melbourne Department of Infrastructure Engineering, Victoria State Government	Visualization tools for multi-scaled spatial-temporal datasets	Pettit et al., 2012
University of Melbourne, Victoria State Government	Social network analysis tool	Beilin et al., 2013
University of Neuchâtel, Karlsruhe Institute of Technology (KIT)	Ecohydrological classification tools for groundwater and landscape management	Bertrand et al., 2012
University of Oulu	Citizen participation in spatial planning	http://apps.webofknowledge.com/
University of Queensland, University of South Australia	Public participation geographic information system (PPGIS)	Brown & Weber, 2013

Tool developer	*Tool*	*Source*
University of the Highlands and Islands, Birmingham City University	Sustainability framework as a toolkit of principles and actions for management (on upland estates in Scotland)	Glass, Scott & Price, 2013
University of Toronto, International Energy Agency Bioenergy Task 31	Sustainable forest management frameworks as tools for organizing, distilling and communicating research and linking policy to practice through standards	Lattimore, Smith & Richardson, 2010
Urban Planning Institute of the Republic of Slovenia	Obtaining and using lay knowledge in order to improve the decision-making process and its results	http://www.envplan.com/epb/fulltext/b34/b32080.pdf
Victoria University et al.	GIS framework (Polyscape) designed to explore spatially explicit synergies and trade-offs amongst ecosystem services to support landscape management. Aids negotiation.	http://www.sciencedirect.com/science/article/pii/S0169204612003532
Vrije Universiteit	Platform approaches as mediation and negotiation tools for common-pool resource governance	Janssen, Goosen & Omtzigt, 2006
Western Washington University	Risk assessment as a tool for environmental management and decision-making at multiple scales	Landis, 2003
Wildlife Conservation Society, United States Agency for International Development	Explains how to conduct a human activity assessment workshop. An easy way to identify, map and quantify multi-stakeholder consensus	http://conserveonline.org/library/TechnicalManual1.pdf/view.html
World Resources Institute	Ecosystems Services Approach can be incorporated into existing decision-making processes to strengthen development strategies	http://www.wri.org/publication/ecosystem-services-a-guide-for-decision-makers
York University	Tool for understanding the complex relationships between ecosystems and human well-being and how environmental management affects their livelihoods	http://link.springer.com/article/10.1007/s00267-012-9822-9/fulltext.html
Zuckerman Institute for Connective Environmental Research (ZICER) at University of East Anglia, Vrije Universiteit Amsterdam	Methodological framework for identifying local capital using scenario storylines, maps and visualizations	Van Berkel et al., 2011

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