CHAPTER

9

Scale considerations in landscape approaches

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Highlights

- Understanding scale differences and dynamics is important for analyzing and facilitating sustainable landscapes
- Choice of, and changes in scale can significantly impact information and understanding in landscapes analysis
- When facilitating processes for sustainable solutions in landscapes, perceived scales of phenomena and interests of actors and the interactions therein are an important consideration
- No single scale is adequate for analyzing, understanding and/or facilitating effective, efficient and equitable sustainable landscapes; a considered set of nested scales is imperative

1. Introduction

Scale can be a key determinant in understanding, planning and managing landscapes. Stakeholders in a landscape will perceive the same differently, given their specific interests. Wilbanks (2006) shows that the choice of scale could determine how much detail of the landscape can be revealed, with detail observed at finer scales. Therefore, several landscape practitioners have asked the question, what is the right/appropriate landscape scale? Common answers are often along the following lines "it depends", "it depends on context", "it depends on the problem", "it depends on the system being analyzed", etc. Is "it depends" a cop-out or is it the fact that there is no straightforward answer? In this chapter, we review how scale has been interpreted and deployed in landscapes and highlight salient considerations for analyzing, understanding and facilitating landscape processes in the context of landscape approaches to sustainable landscapes.

The Millennium Ecosystem Assessment (MEA; 2003) defines scale as the physical dimension of a phenomenon or process in space or time, expressed in physical units. Given this definition, "... a level of organization is not a scale, but it can have a scale" (MEA, 2003; see also Wilbanks, 2006). This perspective is largely a geographic one. In landscape ecology, scale refers mainly to grain (resolution) and extent in space or time (Wu & Qi, 2000). Scale may be absolute (time or spatial units) or relative (expressed as a ratio). Cash et al. (2006) also recognize jurisdictional, institutional, management, network and knowledge scales in human-environment interactions (i.e., in addition to spatial and temporal scales). Scaling is usually defined as the process of extrapolating or translating information from one scale to another (Wu & Qi, 2000). An important element here is 'place'. Place represents a geographic connection to space which in itself is a mental, social and spiritual construct, often connected to institutions and therefore decision-making.

Landscapes represent a given space that is the result of functional interactions between actors, institutions (laws, rules and regulations), and multiple ecological, social and economic components (Minang et al., Chapter 1, this book). Landscape approaches refers to a set of concepts, tools, methods and approaches deployed in landscapes in a bid to achieve multiple economic, social and environmental objectives. Multifunctional landscapes in this chapter refers to landscapes that effectively provide as best possible (relative to potential), all ecosystem functions, i.e., supporting, provisioning, regulatory, cultural, as well as social and economic functions.

Scale matters in landscapes for a number of reasons. Firstly, landscape phenomena unravel differently at different scales. The unravelling is very domain and phenomena specific. Some might unravel in more familiar and complex ways at local scales and become less complex at the global level as a general rule in ecosystems (Wu & Qi, 2000; Wilbanks, 2006). In political and human systems, the gradient of complexity might be less clear. Take the example of water management in the river Nile. At sub-catchment level in the Lake Victoria Basin, to understand land use practices, soil erosion management might be most important. At the Blue or White Nile catchment levels, understanding the land tenure and water policies in Ethiopia, Uganda and Sudan might be most important. At the Nile river basin level, it would be most imperative to understand policies of all ten countries, the Nile Basin agreements and the functioning of the Nile Basin Commission (see Box 9.1).

The second reason why scale matters is the scale of agency, the direct causation of actions (Wilbanks, 2006). Agency is often localized (i.e., with clear boundaries), but inherently embedded in structure, i.e., institutions, rules, policies at local, sub-national, national and global levels. These different levels, can impact landscapes differently, hence must be taken into account.

Another reason for considering scale is potential scale mismatches. Landscapes are composites of the ecological processes and the social systems and their interactions. If the scale at which the social systems operate and the scale at which the ecological processes necessary to ensure the sustainability of the landscape are not fitting, a scale mismatch occurs (Cumming et al., 2006). Finding sustainable solutions for managing landscapes actually requires understanding the scale at which there is the strongest harmony between the social organization and ecological process that take place in the landscape. The process of seeking solutions should therefore seek scales of minimal tradeoffs at which the social system (e.g., institution) can best address the ecological processes.

The above reasons for why scales matter, i.e., differential manifestation of phenomena at various scales and agency (including scale mismatches), do coincide with two potential processes in landscapes, i.e., analyzing and understanding landscapes and facilitating processes for sustainable solutions in landscapes respectively. Analyzing landscapes in the context of multifunctionality would involve assessing and characterizing various

Box 9.1

Water management in the Nile river basin: multiple scales and multiple actors[1]

The Nile river system from its source (Lake Victoria and Lake Tana) to the point it joins the Mediterranean Sea, experiences different interventions arising from multiple actors at various scales. To start, from its source, the water supply to Lake Victoria (the main source of the White Nile) depends on the land use behaviour and land-based livelihood activities by farmers in and around the Highlands of Ethiopia. At such watershed scales, any change in the land use activity has strong implications for the water supply to Lake Victoria as it links with the hydrology, siltation/sedimentation and even water consumption behaviours. Beyond the watershed scale is the sub-basin activities, which usually are based on effects from multiple watersheds. Activities at this scale are influenced by the national and subnational water policies and such decisions may have considerable effect on the overall water supply to the basin. For instance, the decision by the Ethiopian government to build the Grand Ethiopian Renaissance Dam on the Blue Nile covering an area of 1680 km^2 was with the intention to use the river for economic growth through power generation, but it created concerns of water security for countries like Egypt. Lake Victoria presents another dimension of scale wherein multiple countries are involved in managing the water resource. The East African Community (whose member countries share parts of Lake Victoria) established the Lake Victoria Commission, an independent body responsible for ensuring equitable use and management of the water body. Any use of the water from the lake is in accordance with the agreements made between member countries. A bigger scale above all this is the Nile Basin Initiative, a regional intergovernmental partnership established in 1999 with the support of the 10 countries relying on the Nile River to ensure the sustainable management and development of the Nile Basin as a whole.

Though the activities vary between various scales (from watershed to the Nile Basin level), there is strong interdependence between them. Any activity happening at the watershed level has a considerable impact on the basin-level water quantity and quality. This interdependence effect warrants consideration of activities and processes at all scales for a sustainably managed basin. This is why the Nile Basin Initiative is having a number of small-scale projects starting at the watershed level in almost all countries.

functions and/or ecosystem services. This could serve to understand production potential, ecological processes and possibly monitoring purposes. On the other hand, facilitating the maintenance and delivery of multiple functions or ecosystem services requires working with stakeholders in finding solutions to challenges. Very often, analysis, understanding and facilitating sustainable solutions are interconnected. However, for purposes of simplicity and understanding, we will discuss these dimensions as separate streams in this chapter, only bringing them together in our concluding thoughts. But first, let us reflect on the way scale has been interpreted in practice.

2. Current practice in handling scale

Interpretations of scale in landscapes abound in the literature. These interpretations have been diverse, some focusing on size of landscapes, others based on phenomena being dealt with, and some based on institutional structures. In some instances, it is a combination of one or more. Figure 9.1 shows various representations of scale. Figure 9.1a represents a size-focused scale with a relationship to ecological dimensions, while 1b and 1c show various institutional scales.

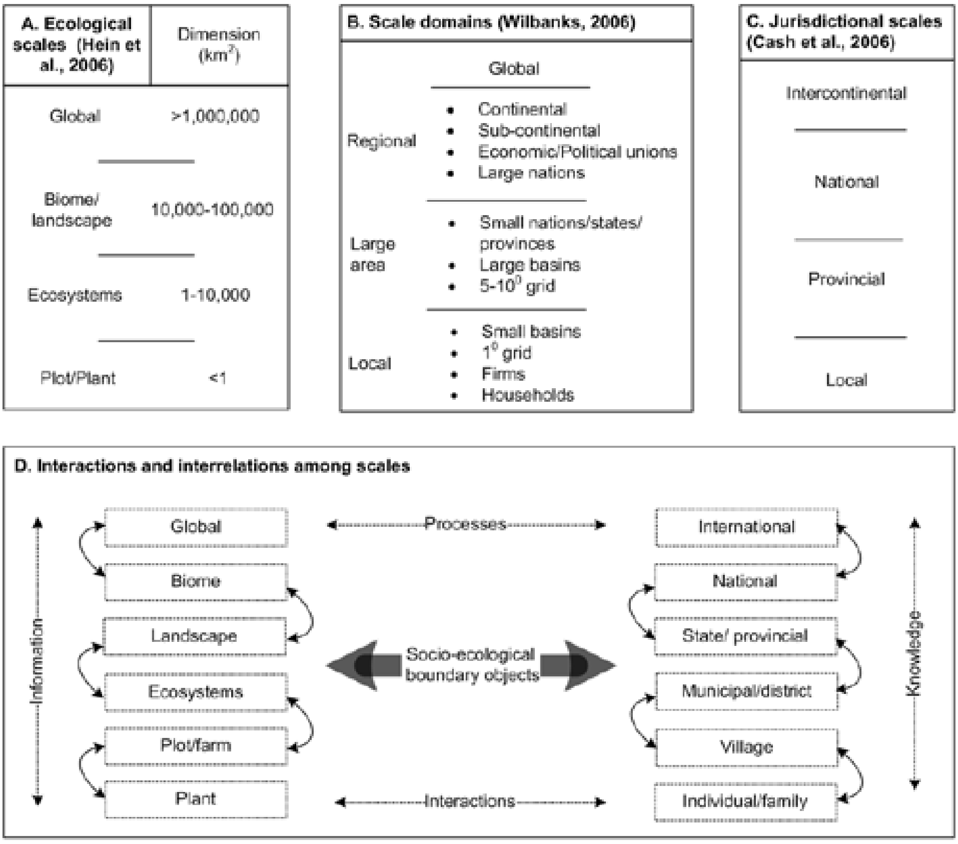

Figure 9.1 Hierarchical representations of scale and scale interactions.

2.1 Size

As part of a definition of landscapes, Forman (1995) describes the spatial extent of landscape to be approximately between 100 and 10000 km^2. The Valley of Visions Landscape Partnerships Scheme (a grants programme of the Heritage Lottery Fund (HLF) operating in the Medway Gap in Kent UK) specifies an area of between 20 and 200 km^2 as one of the many criteria for eligibility (Ahern & Cole, 2012).

2.2 Phenomena-based

Integrated conservation and development and watershed management landscape projects are among those landscape initiatives that have defined landscapes largely around the concepts of conservation areas and water systems respectively. For conservation landscapes, the geography has to constitute a core protected area (reserve, park, sanctuary etc.), a buffer zone and outer areas with rules allowing progressive increases in human activities with increased distance away from the core protected area. Integrated watershed projects have tended to work at multiple levels depending on the project concept. Mostly these projects work at the catchment level, but can also be at sub-catchment or river basin levels (see examples in Box 9.1). Some have interpreted scales in water management to include, blue water (water in lakes, dams and aquifers), green water (moisture in soil) and rainbow water (upper atmospheric transport) (van Noordwijk et al., 2014).

Table 9.1 Summary of scale interpretations in landscapes.

Scale interpretation	**Examples**	**Scale determinants and characteristics**	**Comments**	**Source**
Size	The Valley of Visions Landscape Partnerships Scheme, UK	Defined by minimum area	Scale also determined by uniqueness of area in terms of culture, ecology and management	Ahern & Cole, 2012
Phenomena based	Integrated Conservation and Development Projects (ICDP)	Boundary of protected area (which in itself may be defined by the range of a given species or forest biome/forest unit extent)	Often this goes beyond the core protected area into the buffer zone where development actions are undertaken	Brandon & Wells, 1992; Jackson et al., 2010
	REDD+ demonstration and pilot projects	Could be determined by a forest management unit such as community forest or private forest under REDD+' or jurisdiction-based pilots such as provinces (e.g., in Vietnam and the Democratic Repulic of Congo (DRC))	This may largely depend on five activity areas of REDD+, namely, Reducing Emissions from Deforestation, reducing emissions from Degradation, conservation of forest carbon stocks, sustainable management of forests and enhancement of carbon stocks.	Cerbu et al., 2009; Sills et al., 2009
	Integrated water management	River basin area *Watershed *Water catchment Sub-catchment		Swallow et al., 2002; Blomquist & Schlager, 2005
Institution based	Regional planning	Sub-national levels such as: Province *Region *District *Municipality Village	Determined by degree of decentralization, devolution and centralization of planning functions in a given country	Dalal-Clayton et al., 2003; Rudel & Meyfroidt, 2014
	Jurisdictional REDD+	State (or province) level	This is very much dependent on the degree of centralization, devolution and decentralization, hence governance dimensions	

*Denotes dominant scale

2.3 Institution-based

Regional development and jurisdictional emission reduction programmes are examples of landscape initiatives that have been shaped by institutional levels. Regional development planning and implementation often varies depending on degrees of centralization, devolution and decentralization. Such initiatives could happen at district, municipal, county, provincial or any appropriate sub-national level in a given country. The critical level in any context is likely to link to a critical decision-making level as well. Jurisdictional Reducing Emissions from Deforestation and forest Degradation (REDD+) also entails emission reduction initiatives at levels that correspond to governance and decision-making in given countries. State level jurisdictions in federal nations like Brazil (Acre), Nigeria (Cross-River) and the USA (California), are good examples of jurisdictional emission reduction programmes around the world (Asner, 2011). Still it is not always as simplistic and as clear as these three examples. Landscape initiatives can be more complex and can be defined by multiple interpretations. Table 9.1 summarizes scale interpretations from landscape initiatives.

3. Scale considerations in landscape analysis

Landscape analysis is necessary for understanding the production/supply potential of ecosystem services, valuation of ecosystem services, assessing tradeoffs, understanding the impacts of ecosystem services on livelihoods and monitoring multiple functions. However, very often scale differences can affect analysis and understanding of phenomena at the landscape level. Therefore, in seeking to answer the question, what is the appropriate scale for analyzing a phenomenon, three pre-requisite considerations might be important. These include: i) '*hierarchy in scale*'- the extent to which phenomena manifest at multiple scales and/or are hierarchical in structure; ii) '*scale effects*'- what changes in patterns and processes can be observed when the scale of analysis changes; and iii) '*scaling*'- what theories, methods and models can be used in extrapolating/translating information across scales (Wu & Qi, 2000)?

3.1 Hierarchy in scale

Hierarchy theory assumes that socio-ecological systems in landscapes are multi-scaled and manifest some kind of hierarchy or multiple levelled structure (Cash et al., 2006). If this assumption is true, identifying characteristic scales and hierarchical levels would be one of the most important starting points in analyzing, understanding and predicting landscape systems. Hein et al. (2006) argue that ecosystems services have ecological scales at which they are generated. The scale of analysis should therefore, be determined by the observer using appropriate criteria and analytical methods, e.g., power spectra, fractals, multi-scale ordination, etc. (Turner et al., 1989). While several studies exist, there is no consensus on characteristic scales and hierarchical levels for several phenomena (Wu & Qi, 2000). Hence, specific attention and justification is needed for any robust analysis of multifunctional landscapes.

3.2 Scale effect

Scale effect is an important consideration given the fact that the functioning of ecosystems could depend upon processes that take place over a range of spatial and temporal scales, e.g., from plant interactions at plot level, through meso–scale processes such as fire and insect outbreaks, to climatic and geomorphic processes at the largest macro- and ultramacro-scales (Gunderson & Holling, 2001). Therefore the question arises as to the extent to which smaller scales and shorter time processes and patterns are impacted by larger scales and longer-term processes and vice versa (Hein et al., 2006). Consequently, to what extent would a change of scale in analysis show differences in patterns and scales? Several papers have argued that there is a significant difference in the scale domains where the consequences of climate change adaptation and mitigation are focused with the former being more local while the latter is more global (MEA, 2005).

Wilbanks (2006) argues a general hypothesis would be that observations of many variables at localized scales show greater variance and volatility. In other words, there is loss of information at higher scales. Therefore, complexity is perhaps better observed at meso than at micro, macro and global scales.

3.3 Scaling

Scaling in landscape analysis presents tremendous methodological and theoretical challenges in understanding landscapes. How do we extrapolate from smaller scales to larger scales and how do we translate from larger to smaller scales? There seems to be some kind of understanding of these in homogenous ecological landscapes where the unit of analysis is understood, but less so in heterogeneous landscapes (Wu & Qi, 2000). Most landscapes in developing countries are constituted of mosaic patchworks of relatively small-sized land use units, giving them a heterogeneous nature. These characteristics may sometimes pose challenges related to minimum measurement/map-able units and hence scaling of phenomena, compared to where larger homogeneous units dominate. van Noordwijk and Mulia (2002) demonstrate the usefulness of fractal branching models for deriving tree-specific scaling rules for biomass and nutrient stocks in vegetation when shifting from plantation forestry to mixed forestry or multiple species agroforestry systems.

In terms of scale within social and human systems in landscapes, there is evidence that bottom-up or top-down assessment approaches in investigations do provide different insights and understandings (Turner et al., 1989). For example, the American Association of Geographers found that top-down assessments of potential greenhouse gases emission reduction technologies overestimated potentials because of insensitivity to local constraints while bottom-up assessments tended to underestimate due to inadequate consideration of policy and technological changes (AAG, 2003).

4. Scale considerations when facilitating processes for sustainable solutions in landscapes

Social and human systems (agency) are important components of landscapes and often interact with ecosystems as principal beneficiaries of the services ecosystems offer. These interactions with ecosystems affect these systems positively (stabilizing, enabling) and negatively (destabilizing) depending on the context (political, cultural, economic) (Sayre, 2005; Wilbanks, 2006). Given these potential effects from such interactions, facilitating processes that aim to facilitate sustainable multifunctional landscapes entails behavioural and policy changes with stakeholders in social and human systems in order to elicit the desired effect in the interactions. Hence, understanding scale dynamics and its potential influence on processes that help stakeholders find solutions to challenges in social-ecological systems and/or enhance performance through leveraging (Duguma & Minang, Chapter 10, this book), is extremely important. Such processes could include participatory decision-making, consensus building in solution identification, prioritization, planning, conflict resolution, benefit sharing, and others.

Several authors have also recognized and distinguished a hierarchy of institutions in socio-economic systems (Sayre, 2005; Cash et al., 2006). These range from individuals, family, village, municipal/commune, to province, national, and international levels. These represent levels at which decisions on the use of natural resources, labour and capital are made (Marston, 2000; Sayre, 2005). Decision-making is guided by largely localized interests, values and rules that are shaped by national and international policies and processes. Facilitating decision-making processes at the landscape level to enable sustainable multifunctionality would thus require not only the tools, but also managing interactions between the multiple hierarchical levels (from individual to global).

How actors benefit from various ecosystem functions/services, how they value these and the importance various stakeholders attach to these services determines what is prioritized at what scale. For example, Hein et al. (2006) show that selected ecosystem services in the De Wieden wetlands in the Netherlands, accrues to stakeholders at different scales. Reed cutting and fisheries are only important at the municipal level, recreation most relevant for municipal and provincial levels, and nature conservation is most important at national and international levels. These different preferences/interests at different scales would influence planning priorities and decision-making at various levels and might also reflect on the valuation of the services as well. However, in some instances tremendous tradeoffs can exist between local and external interests (van Noordwijk, 2002).

Facilitation of decision-making and negotiation processes should target either enhancing how actors enable the supply of landscape functions and service and/or reverse how actors inhibit the supply of the same. As we have seen in the case of De Wieden above, these could vary across scales and therefore inter-scales dialogue might be necessary. While the national level might be interested in the nature conservation in De Wierden, they will have to work with the municipal level to make that happen. Power dynamics and resources are extremely important in decision-making. Tools and methods that can allow cross-scale negotiations and interactions across differential power, information and resources are thus important (van Noordwijk et al., 2013).

Horizontal institutional-level interactions are also important in some cases. There is evidence in landscape approaches to REDD+ that drivers of deforestation may lie outside the REDD+ landscape, and notably from adjacent landscapes (Ekadinata et al., 2010). In such instances, horizontal interaction between adjacent landscapes is necessary for addressing the negative forces inhibiting the supply of forest and carbon related services, and in terms of managing leakage.

5. Nested scales

One truth about landscape analysis and/or facilitating processes is that focusing on one scale is not good enough for a complete picture (Sayre, 2005; Cash et al., 2006). As we have seen in preceding sections, landscapes deal with multiple socio-ecological phenomena that often require different scales of analysis as well as institutional levels that interact in decision-making and other actions. Therefore, full understanding and/or facilitation of sustainable landscapes often involves multiple nested scales and levels.

Box 9.2

Nested scales in REDD+

The Reduced Emissions from Deforestation and forest Degradation (REDD+) initiative suggests a mechanism through which countries that elect to reduce their national level of deforestation and loss of forest carbon stocks to below an agreed baseline would receive post facto compensation or rewards. Currently being negotiated within the United Nations Framework Convention on Climate Change (UNFCCC), it aims at making forests more profitable standing rather than destroyed by rewarding governments, individuals and forest managers in developing countries for keeping or restoring forests.

In terms of scale, while the UNFCCC framework provides global policy guidance, the national level is responsible for overall planning, implementation and accounting for emission reductions. At the sub-national level, REDD+ pilots have been set-up at provincial levels in Vietnam, Indonesia, DRC among others. At the local/landscape level, several demonstration projects have been set-up across the world, with a significant number of them building on integrated conservation and development strategies around community forests and protected areas (Sills et al., 2009; Cerbu et al., 2009).

Potential scale mismatches can emerge in this current REDD+ framing. On the one hand, monitoring, reporting and verification (MRV) structures and some government REDD+ pilots (e.g., Vietnam and DRC) are taking the form and dimensions of the current forestry administration or jurisdictions, for example, national, province, district (Forest Trends and Climate Focus, 2011). On the other hand, demonstration projects are built around smaller forest management units and using voluntary carbon market methodologies that may not always match official MRV methodologies (Minang et al., 2014). Furthermore, drivers of forest change transcend the institutional planning scales and current project demonstration scales for REDD+. Such potential mismatches speak to the need for clear rules for nesting across scales.

Some initial explorations of potential rules for nesting across scales in REDD+ have been identified and discussed in the literature, including:

1. Agreed land cover and land use legends for national level MRV, and rules for forest transition, based on multiple scales and reference or reference emission levels development in nested REDD+ (Pedroni et al. 2010; Dewi et al. 2012).
2. A set of rules for nested approaches related to ownership rights of emission reductions, duties and royalties to be paid based upon investments, crediting, benefit-sharing, leakage and risk management (Pedroni et al., 2009; 2010; Cortez et al., 2010; Forest Trends and Climate Focus, 2011; Minang & van Noordwijk, 2013). For example, in Vietnam, the benefit-sharing mechanism framework proposes clear rules on proportions to be retained for management and operational purposes from national, to provincial, and district levels (Hoang et al., 2013).
3. Transparent, effective and efficient procedures for negotiation, registration and validation across scales (Bernard et al., 2014; Alemagi et al., 2014).

In a nutshell, there has been progress towards frameworks and rules for nesting emission reductions in the context of REDD+. However, more research on nesting climate-smart landscapes to national and other scales is needed.

As a result, cross- and across-scale processes and interactions are often more valuable than examining one scale per se. Specific attention should be paid to non-linearities and thresholds of change in any analysis (Sayre, 2005).

An important component in understanding and applying scale concepts in landscape approaches is the fact that as phenomena manifest across scales, and institutions interact across and within levels, a complex web of horizontal and vertical interactions may be required in seeking sustainable solutions at the landscape level. Figure 9.1d shows potential interactions and interrelationships across and between scales. It has been illustrated that in integrated watershed management, specific socio-spatial scales are relevant for interconnected issues that together allow for effective, efficient and equitable management. For example, on-farm soil erosion is a plot or farm-level problem that can be mitigated through more secure property rights for individual farmers, while the sedimentation of streams and deterioration of water quality are larger-scale problems that may require more effective collective action and/or more secure property rights at the village or catchment scale (Swallow et al., 2002). Differences in social-political contexts across nations and regions also shape property rights and collective action institutions (Swallow et al., 2002).

Ostrom (2009) illustrates the need for a common framework for analyzing sustainability across multi-level, socio-ecological systems. She presents four core level sub-systems including resource systems (e.g., a designated protected area with forests, wildlife and water systems), resource units (e.g., trees, shrubs, plants in forests, types of wildlife), governance systems (e.g., institutions for management and rules), and users (e.g., individuals who use the park in multiple ways). These four systems are interacting with each other and are linked to political, social and economic settings as well as other related ecosystems. Each core system is made up of second level variables, for example, productivity of systems, size of units, level of governance. Not only would such a systems approach help guide the accumulation of knowledge required for understanding, but it would potentially help planning, monitoring and enhancement of sustainability.

An important emerging dimension of multifunctional landscapes (including climate-smart landscapes) is the potential value added of nesting landscapes to national policy frameworks such as green economic development, Nationally Appropriate Mitigation Actions (NAMA), REDD+, etc. For example, an emission reductions programme at the district or province level in Indonesia could be nested to the NAMA programme by taking on targets/shares of the national programme commitments (the national emission reduction target in Indonesia is 26% through unilateral actions alongside 7% economic growth). Efficiency gains can accrue from additional public and private investments, support in monitoring emissions reductions and possibly institutional support and capacity building. Nesting arrangements would vary from country to country depending on the governance systems, i.e., devolved or centralized. Principles, rules and methods for nesting are needed (Minang & van Noordwijk, 2013). These are necessary for scaling and actor engagement. An example of scale dynamics and nesting in REDD+ is presented in Box 9.2.

6. Conclusion

We began this chapter seeking to answer the question, what is the appropriate landscape scale? Specifically, we sought to answer this through two practical sub-questions. What is the appropriate scale for analyzing phenomena in landscapes and what scale considerations are needed in facilitating multi-stakeholder decision-making and actions in landscapes?

While evidence from current practices in conservation, integrated watershed management, spatial planning and others suggest that scale has been determined by dominant phenomena such as the protected area, the watershed and jurisdictional boundaries, respectively, in a multifunctional landscape, several factors need to be considered. Three main related dimensions of scale can be considered in the development of sustainable landscapes including: i) landscape analysis, ii) landscape facilitation and iii) nested scales.

6.1 Landscape analysis

Landscape analysis and understanding is about information and complexity differences with changes in scale. Choice of, and changes in, scale can significantly impact information and understanding in landscapes analysis. This depends on three related principles: i) '*hierarchy in scale*'- the extent to which phenomena manifest at multiple scales and/or hierarchical in structure; ii) '*scale effects*'- what changes in patterns and processes can be observed when the scale of analysis changes; and iii) '*scaling*'- what theories, methods and models can be used in extrapolating/translating information across scales. Thinking around these principles in the context of analysis is helpful.

6.2 Landscape facilitation

When facilitating processes for sustainable solutions in landscapes, perceived scales of phenomena and interests of actors and the interactions therein are an important consideration. Perceived scales of landscapes will vary according to interests of stakeholders, which are often divergent, hence a need to facilitate negotiations towards appropriate and agreed solutions. Facilitating interactions in such a manner that enables behavioural and policy changes that enhance ecosystem functions through joint knowledge generation, planning and decision-making is thus imperative.

6.3 Nested scales

Lastly, any successful sustainable multifunctional landscape is best approached from a multi- and nested-scale perspective in terms of analysis and facilitation because no single scale is sufficient for comprehensive analysis, nor for facilitating processes. It should be recognized that cross-scale processes and interactions are as important and perhaps more important than scale per se. Therefore, going beyond the vertical and horizontal interactions across scales, to ensuring landscapes are nested to national policy frameworks can be critical for success in landscape approaches.

Endnote

1 www.nilebasin.org; www.lvbcom.org

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Livestock grazing in a restored Ngitili system. Photo credit: Lalisa A. Duguma