

Chapter 14

Synthesis: Ecosystem Restoration in the Context of Socio-Ecological Production Landscapes and Seascapes (SEPLS)



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14.1 Concept: Can Landscape Approaches Underpin Ecosystem Restoration?

Landscape approaches are characterised by an explicit recognition of social-ecological systems in different contexts, resulting in interventions that concurrently address anthropogenic issues of concern to people, as well as biodiversity decline, and ecosystem degradation. Furthermore, a social-ecological paradigm can also be used to address concerns across multiple stakeholders to help ensure that conservation and sustainable use of natural resources are performed in an equitable manner.

Optimally, ecosystem restoration is best supported by a multipronged and trans-disciplinary approach to addressing underlying natural and anthropogenic drivers of degradation. In this context, landscape approaches could potentially play a pivotal

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role. Some of the most relevant features of these approaches that enable effective and successful restoration include:

People and Their Practices Typically, SEPLS are sites of diverse resources, mosaic ecosystems, and multiple stakeholders who relate to the landscape or seascape in various ways. To the local communities, SEPLS provide a means of livelihood, enable attainment of basic material needs (e.g. food, timber, and water), and are linked to health and well-being (e.g. physical and mental health, sense of identity or belonging, and other cultural values). To those engaged in commercial activities, they provide opportunities for economic gain from both within and outside the landscape and/or seascape through trade in natural resources-related products and services. For local and national administrators, there is an ongoing need to address issues of sustainable use and the reconciliation of conservation, restoration, and livelihood needs, particularly within large-scale development activities that may include land and sea use change.

Balancing ecocentric and anthropocentric drivers is considered to be a priority for the long-term health of ecosystems across several development settings, as well as for human health and well-being (Watts et al. 2015). Optimising SEPLS management for restoration requires a common understanding, across different stakeholders, of historical land and sea uses, the competing landscape needs of the users, and alignment with relevant policy goals. It follows therefore that social-ecological diversity would form the basis to identify and implement different types of solutions (cutting across ecological, economic, and social parameters) that work in various contexts—e.g. peace parks in Nepal (Chap. 4), the system of producing several varieties of rice staple in India (Chap. 8), Ridge-to-Reef food systems and marine bioregional engagement in the Philippines (Chap. 13), and shifting cultivation systems under changing socio-economic circumstances in India and Thailand (Chap. 7).

Knowledge Assets Given the diversity of actors and resources, SEPLS sites are often rich in Indigenous and Local Knowledge (ILK) that has been held, innovated, practiced, and developed over time by Indigenous Peoples and Local Communities (IPLCs) and further, scientific and expert knowledge. Appropriate integration of these different systems of knowledge is often practiced towards necessary solutions in the landscape and/or seascape—e.g. participatory tree nursery species selection and reforestation strategies in the Philippines (Chap. 13), rangeland restoration in Chyulu, Kenya (Chap. 3), sacred groves reservation in Ghana (Chap. 2), Indigenous and Community Conserved Areas (ICCAs) in South China (Chap. 12), and the use of traditional knowledge on tree species to support ecosystem restoration in fallow lands in India and Thailand (Chap. 7).

Synergistic Governance Approaches The wide range of actors involved in the use and management of a landscape and/or seascape (and the mosaic of ecosystems therein) necessitates co-operative approaches to decision-making to ensure management activities are oriented towards promoting restoration and sustainable use. These involve ensuring cross-sectoral partnerships that allow for policy coherence and

sustaining multifunctionality of the landscape or seascape. They ensure a nested system of governance from international (wherever appropriate) to national to local and thereby are also inclusive of local cultural norms and traditional knowledge, while fostering collaborative management (Watts et al. 2021). Such approaches can be facilitated through multi-stakeholder platforms and harmonised objectives between different actors (e.g. Chaps. 10–13). They recognise the various rights of the communities, enabling capacity development and awareness raising of different stakeholders on the interdependence and interconnections between environmental health and human well-being—e.g. Community Resource Management Committees (CRMCs) in Ghana (Chap. 9), conservation of rice-based ecosystems in India (Chap. 8), Ecohealth approaches and forest management in the Philippines (Chap. 13), the Community Resource Management Area (CREMA) system in Ghana (Chap. 2), and traditional resource management practices in India and Thailand (Chap. 7).

Leveraging landscape approaches for ecosystem restoration that benefits biodiversity, ecosystems, and human well-being in SEPLS can be undertaken by paying attention to the following:

- Identifying and addressing drivers of degradation (e.g. production practices, invasive species, policies, and the political and economic causes of these drivers).
- Leveraging cross fertilisation of knowledge, including scientific, expert, and ILK (referred to as knowledge weaving) (Tengö et al. 2014).
- Identifying the potential trade-offs between biodiversity conservation/restoration and human needs (e.g. livelihood security, human–wildlife conflict, large-scale economic development, and other subsistence-related activities).
- Quantifying costs and losses (to household incomes, private sector revenue, and public infrastructure) from ecosystem degradation and related impacts, focusing on the costs of action vs. inaction.
- Linking restoration activities with priorities and needs of IPLCs.
- Broadening the scope of ecosystem restoration to include health (including that of people, animals, and environment), well-being, and economic development in consonance with the priorities of all relevant stakeholders who need to act to ensure social-ecological resilience.
- Taking stock of emerging issues—including climate change, new forms of production practices, pandemics, and ways to interlink disciplinary and sectoral interventions (e.g. nexus approaches viz. One Health, Ecohealth, food-water-energy, and disaster risk reduction) that synergise across multiple environmental and developmental goals.
- Supporting community-driven development of nature-based value chain enterprises.
- Fostering multi-stakeholder platforms to ensure multiple voices, including those of youth and women in communities and of the private sector and special interest groups (e.g. faith-based organisations), is considered to build consensus through their participation in policy and decision-making.

- Enhancing enabling factors such as raising public awareness, mobilising financial resources, developing capacities to tackle the complexity of issues, advancing adaptive co-management practices (inclusive of monitoring and evaluation), and striving to foster political will towards restoration actions.
- Identifying and responding to priorities of different stakeholders and determining timely and reflexive actions.

Embedding Biodiversity in Implementing Landscape Approaches to Ecosystem Restoration

While ecosystem restoration could be pursued through different pathways, a special interest at the SEPLS level is to make sure that activities aimed at ecosystem restoration are biodiversity friendly to ensure the sustenance of bio-cultural heritage and diversity and human well-being. Towards this, some pragmatic approaches are highlighted below:

- Explicitly identifying how restoration practices will promote biodiversity conservation and restoration, and the resultant trade-offs.
- Ensuring appropriate incentives to land managers and different stakeholders. These could range from those appealing to economic (e.g. innovative markets for various ecosystem functions such as water regulation, payment for ecosystem services (PES), and carbon funds), and cultural values (e.g. sense of place, cultural identity, educational value, and aesthetics), to those related to a better quality of life (e.g. disaster risk reduction, biodiversity-based livelihoods such as ecotourism, non-timber forest products (NTFPs) based livelihoods, and successional agroforestry).
- Promoting community conservation efforts and harnessing traditional knowledge that uses natural processes for ecosystem restoration (e.g. group farming, community-based farming committees, community conserved areas) that foster shared values.
- Customising landscape approaches to different ecosystems and social contexts to fit local conditions and resources [e.g. trans-ecosystem local food systems (Alejos et al. 2021)].
- Developing restoration plans that are based on comprehensive baseline assessments that clearly outline the degree of biodiversity richness and help establish local priority biodiversity goals.

The following sections highlight some methodologies, approaches, and strategies to explicate how this may be achieved.

14.2 Methodology

Given the large investments (e.g. finance, labour, and time) made in restoration activities, it is critical to assess their effectiveness. Such an assessment can also provide a basis for decision-making and management (Zhai et al. 2022) and improve best practices (Wortley et al. 2013).

Measuring the effectiveness of ecosystem restoration depends on well-defined and clear goals and objectives that specify the desired direction and magnitude of change (FAO et al. 2021). This also allows for clear communication of expected results, serves as a foundation for planning and implementation, and enables monitoring and evaluation and thus adaptive management. Nevertheless, ecosystem restoration frequently fails to achieve the expected goals due to the complexity and diversity of ecological, economic, social, cultural, and other elements associated with restoration (Hopfensperger et al. 2007), especially those relating to resolving trade-offs between multiple goals and objectives in a transparent and equitable manner (Villarreal-Rosas et al. 2021).

From the perspective of SEPLS, the measurement of restoration effectiveness necessitates holistic approaches that integrate the ecological, social, cultural, and economic dimensions of changes in the landscapes and seascapes. This section discusses how we can measure, evaluate, and monitor the effectiveness of SEPLS management to prevent, halt, and reverse degradation and achieve restoration objectives. Specifically, we discuss the benefits of measuring effectiveness, indicators to gauge and evaluate effects and outcomes, and tools for measuring the effectiveness of restoration through SEPLS management.

What Are the Benefits of Measuring Effectiveness (Both Tangible and Intangible) that Have Emerged from Ecosystem Restoration Through a SEPLS Lens?

Measuring the effectiveness of ecosystem restoration in the context of SEPLS management has numerous benefits ranging from improvement in providing goods and services for community livelihoods to better provision of intangible benefits such as knowledge transfer and conservation of ILK associated with ecosystem restoration and management. The following are some of the advantages of measuring the effectiveness of ecosystem restoration:

- *Transfer knowledge and share lessons learnt:* Knowledge transfer on SEPLS management is crucial to measuring ecosystem restoration by various stakeholders including future generations. Through inter-generational transfer, knowledge is handed down on how natural resources can be preserved and sustained. Practices and experiences of ecosystem restoration and management building on local knowledge can be used as lessons for future restoration projects and scaling up of such practices and innovations. Furthermore, they can be unpacked to the public, and other stakeholders interested in restoration can use the results and procedures to develop or improve their projects. Importantly, stakeholder participation during the span of the restoration project can foster knowledge

acquisition, support capacity development, and enhance connectivity among stakeholders at the local, national, and global levels. This facilitates valid knowledge transfer and sharing for scaling up and out the restoration, as seen in the case studies herein (e.g. Chaps. 5, 10, and 13).

- *Facilitate adaptive management:* Because the process of restoration is normally lengthy, changes in conditions are almost unavoidable. New data and ideas could be incorporated into the planning and implementation of a project to ensure that the restoration objectives are achieved effectively despite the inevitable changes. This not only supports success in restoration, but also promotes adaptive management of SEPLS (e.g. Chap. 7).
- *Support contribution to human well-being and biodiversity:* Ecosystem health and human well-being are equivalently important within the SEPLS concept. Restoration activities have a vital role in recovering and sustaining biological and functional diversity, mitigating and adapting to climate change, and maintaining the livelihoods of local communities. In this regard, the evaluation of effectiveness can show, for instance, how much restoration helps to recover biodiversity and improve the well-being of local communities at the same time, and how much it enhances community resilience to climate change (e.g. carbon sequestration and storage, flood control, and erosion control). Furthermore, measuring the effectiveness of restoration through the valuation of ecosystem services allows for attaching values to certain ecosystem services that are not directly traded within a market or lacking in defined market prices (e.g. willingness to pay and hedonic pricing). As such, the evaluation helps explore ways to ensure that the communities and biodiversity can continuously and sustainably benefit from the restoration (e.g. Chaps. 10 and 13).
- *Influence policy frameworks:* Restoration projects that are well aligned with local needs and government priorities help project implementers effectively engage stakeholders. When restoration activities are the local priority, local communities support the restoration process and may be willing to pay for it. More importantly, they have a strong sense of ownership. This enables effective participation in the activities and thus meaningfully affects the restoration programme. The same holds if projects align with government priorities. Working with responsible government institutions for a shared goal of ecosystem restoration can help attain the restoration objectives effectively by mobilising financial and human resources on a common agenda. The restoration activities could also align with businesses that wish to offset their corporate social responsibilities through restoration. Therefore, promoting and replicating restoration practices and methods based on evaluation helps to better design laws, policies, and plans at the local, national, and global levels to prevent, halt, and reverse ecosystem degradation. Policymakers at any level can use the results as a benchmark to formulate and improve policies for meaningful action involving numerous tangible and intangible benefits from SEPLS management (e.g. Chaps. 7, 10, and 13).
- *Define the success of restoration:* Success or failure rests on how to manage trade-offs among multiple effects of restoration (including positive and negative impacts on ecosystem services, biodiversity, livelihoods, and human well-being)

while incurring restoration costs. Examining the trade-offs in consideration of the associated costs can help decision makers to better understand a full range of actual impacts of restoration, guide the goal setting of future restoration activities, and effectively allocate limited resources. In addition, although we always envisage restoration efforts to be successful, it is vital to adequately report on the failures and how they were addressed. Recording failures and remediation experiences can serve as learning points for future restoration projects.

What Indicators or Measurements Determine and Evaluate the Effects and Outcomes of Ecosystem Restoration Through Managing SEPLS?

Evaluating restoration effectiveness is a complicated task, as evident in numerous debates over what constitutes effective restoration and how to best evaluate it (Wortley et al. 2013). It depends on the specific objectives of the restoration project, which may have its own set of indicators for monitoring and evaluation. These indicators are essential for measuring effectiveness and play a crucial part in ecosystem restoration and management. Every effort needs to be made to ensure indicators or measurements are aligned with overall goals or objectives. For instance, restoration activities intended to mitigate the effects of one or more ecosystem challenges must at the very least consider how the success in this regard will be measured (Schultz et al. 2012). Although each restoration project has specific objectives and associated indicators, the following may be used as reference points to evaluate restoration outcomes:

- *Quality of life*: Improvements in the overall quality of life of those who live in a landscape or seascape (e.g. impacts on food and water security, livelihoods, health, and human well-being) can be used as an indicator to gauge the impact of restoration on the ecological, economic, and social dimensions of life in the community (e.g. Chaps. 6 and 13).
- *Natural capital*: Positive impacts of restoration on natural capital [i.e. stock of natural assets that includes soil, air, water, and living things (NCC 2013)] can be measured as improvements, like those in biodiversity and various natural systems of the Earth. This may manifest in terms of ecological functioning (e.g. nutrient cycling, erosion control, and carbon sequestration), land productivity, vegetation cover, natural regeneration, invasive species control, biodiversity richness, and air and water quality (e.g. Chaps. 2, 5, 9, 10, and 13).
- *Youth and women involvement and capacity development*: Creating enabling conditions for active participation of youth and women in restoration activities helps to transfer ecological knowledge to multiple actors thus facilitating the sustainable use and management of landscape and seascape resources. The involvement of youth also strengthens the long-term perspectives on ecosystem restoration activities. The effect of restoration on youth and women through capacity development, employment, and income generation can be considered an indicator (e.g. Chaps. 2, 4, and 13).
- *Community empowerment and participation*: Progress or achievements in active and meaningful participation of local communities in the restoration process from

the planning to the implementation stage can be considered as one of the measurements of restoration outcomes. This may include gender mainstreaming and capacity development of local communities in terms of knowledge, skills, social cohesion, and appreciation of nature's contributions to people through training, facilitation, and other community engagement approaches (e.g. Chaps. 2, 6, 8–11, and 13).

- *Sustainable Development Goals (SDGs)*: Ecosystem restoration through managing SEPLS can help achieve human well-being as captured by multiple relevant SDGs (FAO and UNEP 2022). For instance, from the human dimension, improved livelihoods (e.g. income and employment) support SDG 1 (No poverty), while improved food security and human well-being are linked explicitly to SDG 2 (Zero hunger) and SDG 3 (Good health and well-being), respectively. Other SDGs are related in terms of ecological aspects, including SDG 13 (Climate action), SDG 14 (Life below water), and SDG 15 (Life on land). The indicators of SDGs can be scaled down and up with careful consideration of potential cross-scale trade-offs to evaluate to what extent the restoration activities on the landscape or seascape scale help to contribute to the 2030 Agenda for Sustainable Development.
- *Climate resilience*: The contribution of SEPLS management to restoration can be evaluated in terms of resilience to climate-related risks, vulnerabilities, and impacts. For instance, restored vegetation cover could reduce the effects of flooding on livelihood assets and infrastructure, prevent soil erosion, and contribute to increased land productivity—e.g. participatory seed conservation and exchange programme in India (Chap. 8) and creation of a network of nurseries in the Philippines (Chap. 13).

What Are the Tools and Methods to Identify and Keep Track of the Effectiveness of SEPLS Management in Facilitating Ecosystem Restoration?

A comprehensive methodological framework would allow SEPLS managers to identify and address multiple needs and interests in the landscape or seascape and facilitate concerted efforts based on their findings for restoration and sustainability. Furthermore, if such a framework renders global consistency and comparability (e.g. universal monitoring standards), it would enable better communication with higher-level policy arenas and science-policy interfaces. The following are some of the tools, methods, and approaches that have helped to identify and keep track of the effectiveness of restoration in the context of SEPLS management. Some of the approaches and techniques were directly applied in the case studies presented in this volume (as reference chapters are indicated), while others were suggested by the practitioners and researchers who participated in the IPSI Case Study Workshop held in 2022.

- *Multi-stakeholder (participatory) approach*: This approach emphasises the active participation of community members, organisational affiliates, and researchers in all aspects of the restoration process (Israel et al. 1998). Participants contribute

their expertise to improve their understanding of a given factor and incorporate the acquired knowledge into action to benefit the community involved. The people in the community should be part of the entire project cycle, including the planning stage, to build consensus and create a sense of ownership for sustainability, and the evaluation process, to have a shared valuation of the benefits gained from restoration (e.g. Chaps. 4, 6, and 8–13).

- *Indicators of Resilience in SEPLS*: This is a monitoring and evaluation tool that has proved effective in many SEPLS around the world (Dunbar et al. 2020). As a community-based participatory instrument used for assessing social-ecological resilience in SEPLS, the indicators [appropriately localised to SEPLS specifics in some instances (Karimova et al. 2022)] may also be applied on a regular and consistent basis to track the effectiveness of ecosystem restoration efforts in SEPLS over time and to understand the impact of the interventions (Dublin and Natori 2020).
- *Ecohealth paradigm*: This paradigm hinges on a transdisciplinary approach to addressing ecological, cultural, and socio-economic changes for sustaining and enhancing ecosystem and human health and well-being. This approach recognises ecosystems as another critical determinant of human health (Orlando et al. 2022) and has been suggested as a potential lens to balance the ecosystem approach to health and the health approach to ecosystems (Watts et al. 2015). It gives dual attention to the ecosystem and public health and facilitates bridging a gap between them that could be filled through ecosystem restoration (e.g. Chap. 13).
- *Action research*: To institutionalise SEPLS management inclusive of restoration activities, this approach provides a model for iterative designs that includes the steps of planning and assessment and evaluation that can be easily built into annual planning and funding regimens. Also considering international exchange and synergies (Watts and Pajaro 2014), it is recognised as a significant approach to sustainable development (Keahey 2021) (e.g. Chap. 13).
- *Biodiversity indexes and indicators*: Already available indexes for measuring changes in biodiversity can also be used to determine how effective the restoration is in improving biodiversity—e.g. Simpson index (Simpson 1949), Shannon Index (H') (Supriatna 2018), Pielou's evenness index (Pielou 1969), and Menhinick's richness index (Menhinick 1964) (e.g. Chaps. 5, 7, and 13).
- *Information and Communications Technology (ICT) and emerging technology*: Currently available technological tools and devices can be used for collection, analysis, and reporting of the changes made by restoration activities [e.g. mobile applications, remote sensing, and Geographic Information Systems (GIS)]:
 - *Mobile-based technology*: Mobile phones with user-friendly applications can be used in field data collection for planning, monitoring, and evaluation. These technologies can also be used for real-time data sharing and analysis, which allows organisations, community members, and other stakeholders to monitor and evaluate data to improve planning and implementation (e.g. Chaps. 2, 4, 8, and 13).

- *GIS and remote sensing*: GIS and remote sensing can be used to quantify the area restored through SEPLS management (Zhai et al. 2022). Remote sensing is a powerful tool for generating data for understanding and monitoring ecosystem restoration by obtaining information from electromagnetic radiation reflected or emitted from the Earth's surface and atmosphere. Researchers have used it for many years to assess vegetation phenology, land use and land cover change, species pattern and distribution, and to estimate vegetation biomass which is critical for understanding the impact of restoration on climate change and the carbon cycle (e.g. Chap. 3). GIS can be used to identify specific management boundaries for different land use priorities (e.g. Chap. 13). It can also play a critical role in putting certain concepts [e.g. landscape ecology (Turner et al. 2001) and reserve design (Peck 1998)] into practice, as well as in managing the geographic information that ecosystem restoration activities generate, which helps to assess progress and facilitate effective planning.
- *Capital assets framework*: This approach was adjusted from the sustainable livelihoods framework. It considers five kinds of capital assets (financial, human, natural, physical, and social) to understand livelihood outcomes and risk (Zhang et al. 2020). Financial capital includes credit and savings, pensions, and subsidies; human capital includes a wide range of human resources as well as social and personality traits such as education, skill, knowledge, health, and labour; natural capital includes natural resources such as forest resources, soil resources, and wild resources; physical capital includes the basic infrastructure and goods required to support livelihoods; and social capital includes social resources (Lax and Krug 2013; Zhang et al. 2020). The five capital assets can be evaluated using a variety of indicators, criteria, and principles. For the valuation and implementation of the restoration programme, beneficiaries can be asked to rate their perceptions of different indicators on a 1–5 Likert scale from 1 (low) to 5 (high) (Ken et al. 2020).
- *Economics of ecosystem restoration*: In recent years, economic principles, tools, and instruments have become more extensively and comprehensively applied in restoration studies (Iftekhar et al. 2017). For instance, a new framework for ecological restoration includes the costs for project development, implementation, and maintenance, as well as opportunity costs and net income, while taking into account the economic value of recovered biodiversity and restored ecosystem services (Iftekhar and Polyakov 2021). The economics of ecosystem restoration thus provides information for better-evaluating restoration outcomes and helps decision makers to allocate scarce resources among alternative restoration projects. Also, The Economics of Ecosystem Restoration (TEER) was launched in 2019 as a new multi-partner initiative in an attempt to estimate the net benefits per hectare per year of any restoration intervention in a given context.
- *The 5-Star Recovery System*: As a tool developed to track progress in ecosystem recovery (McDonald et al. 2016), the 5-Star Recovery System can assist managers, practitioners, and others in monitoring progress towards recovery goals

over time and assessing and ranking the degree of recovery of a site. This tool employs a 5-star scale representing a cumulative gradient of similarity to a reference ecosystem recovery state, ranging from very low to very high. An overall assessment can assign a restoration site to one of five recovery levels (1–5 stars).

14.3 How Can We Leverage Landscape Approaches in Restoring Ecosystems for More Sustainable Futures?

SEPLS management hinges on landscape approaches, by which diverse stakeholders are brought in to negotiate and collaborate for balancing multiple objectives in a given spatial area on land and/or sea. While place-based, multi-stakeholder approaches alone cannot address all challenges, they do provide opportunities for minimising trade-offs through collaboration, and for effectively restoring ecosystems to move towards more sustainable futures. The section below describes the challenges that actors regularly encounter in engaging in ecosystem restoration and managing SEPLS. It then discusses ways forward to tackle these challenges, develop synergistic strategies, and implement restoration activities for long-term SEPLS management.

14.3.1 Challenges in Ecosystem Restoration

Restoration efforts need to be planned and implemented in an integrated, participatory, and continuous manner to achieve restoration objectives (i.e. prevent, halt, and reverse land and sea degradation) and contribute to sustainable development. However, as shown in the previous chapters, actors operating at the landscape and/or seascape level face multiple challenges throughout the planning cycle to meet these goals. The challenges are mainly to (1) secure and otherwise raise capacities and resources for initiating the effort, (2) promote and facilitate the initiative in a concerted and coordinated way, and (3) sustain the effort and if needed, adapt it to changes.

Capacities and Resources

As a prerequisite, capacities and resources should be available and accessible for actors engaging in restoration activities. These capacities and resources range from intangible (e.g. knowledge, motivation, experience, trust, and innovation) to tangible ones (e.g. budget and finance, equipment, and labour). If these are already available or easily acquired, the actors can draw on them to plan and implement the activities autonomously. Yet, it is often the case that they are insufficient to fully grapple with restoration. Moreover, accessibility to the needed resources (e.g. time and technical

tools) varies among different stakeholders, whereby they are often least available to those who are most vulnerable to land or sea degradation. This makes the challenges in restoration more intractable.

Ecosystem restoration requires certain changes in the pathways through which people interact with nature. It is essential that local communities recognise the problems with their current trajectories and are motivated to embark on changes for better human–nature relationships (e.g. Edake et al. 2019). However, problems are not always salient and can be easily discounted or disregarded in everyday priorities. Furthermore, causal factors and relationships to the problems are often hard to comprehend. Indeed, SEPLS are dynamic, complex systems involving plenty of uncertainties, and thus require careful observation and continued monitoring for sustainable management. In particular, the management of seascapes, including underwater dimensions, epitomises the challenges in knowing, understanding, stewarding, and administrating such fluid, dynamic, and elusive systems that rapidly change in space and time without horizontal and vertical boundaries, while being influenced by various environmental and anthropogenic factors (e.g. climate change, currents, tides, temperature, microhabitats, and social and economic activities) (Maxwell et al. 2015). Moreover, in connection to the restoration level to be achieved, to what extent people can and should intervene in natural processes is highly debatable and controversial from a variety of standpoints encompassing ecological, social, cultural, and ethical dimensions (Filbee-Dexter and Smajdor 2019; Florentina-Cristina et al. 2017).

The ability to change the pathways for restoration primarily rests on local buy-in, acceptance, and agreement on new initiatives or interventions in human–nature interactions. By shifting the ways and means of living associated with nature, people in the local communities may lose the conventional forms and patterns of living on which they place value. Some case studies suggest that state policies often push their priorities and logic, while overlooking local needs, opportunity cost, implicit local contexts, and cultural nuances related to ecosystem restoration (e.g. Chap. 7). This could lead, for instance, to mismatches between given incentives and actual motivations for local participation, or a lack of local support for restoration initiatives. Failures in contextualising restoration in local settings may undermine the credibility of governmental interventions or erode trust in government authorities. This not only hinders synergies to be built among stakeholders, but also may result in inaction or even negative consequences for the well-being of local communities.

Restoration initiatives can be fruitfully informed by culture, ILK, and traditional practices that have historically ensured sustainable use and management of natural resources. Such culture and traditions can be carefully drawn on for restoration to make sure knowledge holders are respected and equitably rewarded, compensated, or benefited. To do so, Free, Prior, and Informed Consent (FPIC) is expected to be sought in the restoration projects. Interestingly, this FPIC process appears to be already built in for most cases of SEPLS management involving restoration activities where IPLCs are placed at the centre of the restoration initiatives and are taking the lead in improving their environmental and livelihood conditions (e.g. Chaps. 1 and 11–13).

Nevertheless, many communities today are faced with weakening or erosion of ILK, while experiencing rapid demographic, socio-economic, and ecological changes such as outmigration, urbanisation, technological development, and land abandonment (e.g. Chaps. 9 and 12). In this context, it is imperative not only to revive such culture and traditions, but also to bring in additional resources or develop new capacities to address emerging challenges and resolve unprecedented issues in managing SEPLS. This is important particularly when an intervention is introduced to local communities by external stakeholders or in partnership with multiple stakeholders. In some cases, the communities may be unprepared for new development (e.g. tourism, infrastructural development, and afforestation), disallowing them to concurrently engage in conservation practices (e.g. Chaps. 12 and 13). In other cases, externally funded projects could enable multi-stakeholder collaboration on restoration, but such synergistic actions may not happen unless some tangible resources (e.g. budget and human resources) are procured (e.g. Chaps. 10–13).

Coordination and Negotiation

To develop restoration strategies and facilitate their implementation, careful attention should be paid to trade-offs, including potential ones, manifested within and beyond a landscape or seascape. In the face of trade-offs within a landscape or seascape, reaching an agreement among stakeholders (e.g. local communities, regional and national governments, private sector, and NGOs) may be a challenge, given their diverse interests, priorities, and roles and responsibilities in restoration.

In this connection, rights and access to natural resources need to be deliberately examined, attending to political and economic power asymmetries between different stakeholders. For instance, the establishment of strictly protected areas may lead to positive environmental outcomes (e.g. biodiversity conservation). However, it could be detrimental to locals' rights to natural resource use by limiting their access to those resources on which they depend for their livelihoods (e.g. hunting restrictions imposed by authorities), or may raise short-term opportunity cost to locals who could otherwise generate income (e.g. limiting the use of mangrove forest for aquaculture). These trade-offs affecting the survival and well-being of local communities can happen particularly when communities are not involved in the decision-making process. Thus, it is crucial to empower and support the local community to participate in decision-making processes for restoration. Accordingly, such local participation and empowerment should be widely supported and ensured through implementation of principles of fair and equitable benefit-sharing. This would help to develop a self-sustaining system within a landscape and/or seascape (e.g. trans-ecosystem food systems in Chap. 13, and a peace park dealing with trade-offs between forestry and ecotourism in Chap. 4).

However, trade-offs can go beyond the readily recognisable temporal and spatial scale of a landscape or seascape, making the challenges rather tangled for coordination and negotiation. First, restoration effects can transcend a certain timeframe through interlinking with multiple social and ecological processes. For example, mangrove restoration aiming at both biodiversity conservation and ecotourism development within a seascape may result in the improvement of environmental

quality only for a certain period of time; however, in the long run, it may instigate new development projects (e.g. infrastructural development and mining) alongside the flourishing ecotourism or may be influenced by continued or expanded industrial activities (e.g. Chaps. 9, 11, and 12). This may in turn negatively impact ecological health and the well-being of local communities over time.

Also, restoration efforts can be affected by drivers arising from a larger managerial and spatial scale that surpasses the local scale. For instance, community-based restoration activities can facilitate sustainable natural resource management on a local scale (e.g. those integrating rangeland restoration, biodiversity conservation, and livelihoods) but can be influenced by external drivers such as climate change, population growth, migration, fishing industries, and land subdivision authorised by government (e.g. Chap. 3). Even longstanding local restoration initiatives may face new threats, for instance in the sense that initiatives can be easily undone by government-funded large-scale development projects (e.g. Chaps. 10 and 13).

Furthermore, trade-offs between competing needs and interests extend beyond national boundaries. Certain selected endangered wildlife species (e.g. jaguars, sea turtles, and fish species) can be effectively conserved in one country through the enforcement of its national conservation policies, but if such species cross into another country that does not have an appropriate conservation policy, they may be subjected to exploitation like poaching. Thus, not only national but also regional and international responses or measures are important to support local restoration initiatives and intervene in external factors that have adverse effects on such local efforts (e.g. commercial fishing, plantation expansion, and perverse financial incentives). Here, different priorities across multiple sectors even at a certain governance level (i.e. lack of policy coherence) can be a barrier to a concerted restoration effort, confusing stakeholders with discrepant or contradictory policies and associated measures (e.g. food production policy vs. nature conservation policy) or sometimes having inconsistent financial support (e.g. budgeting conservation measures vs. incentivising farming practices that are not necessarily environmentally friendly).

Financial Sustainability and Adaptability

As mentioned above, restoration initiatives require new resources and capacities, which could be beyond what the local communities possess. Thus, external support (e.g. donor financing, resource mobilisation, and technology transfer) is often needed to initiate restoration activities, enhance local capacities, or help the government with reducing harmful incentives. However, external support could give rise to financial dependency or even trade-offs (e.g. ecotourism development leading to adverse environmental outcomes), whereby local communities may be confronted with new challenges derived from external factors (e.g. climate change and global trade). Therefore, financial sustainability is crucial to ensure good ideas and practices of natural resource use and management continue even without external funding.

Related to this, project ownership and the adaptive capacities of locals need to be fostered and continuously enhanced to address negative trade-offs and build resilience against changes or shocks. To do so, a post-project sustainability plan

(e.g. strategic capacity development, empowerment, public-private partnership, networking, and mechanisms for incentives) should be developed and built into a restoration initiative. In addition, some incentive mechanisms (e.g. carbon credits, payments for ecosystem services (PES), awards to praise individuals or groups engaging in conservation, and farmers' rights to traditional crop varieties) help to ensure financial sustainability and facilitate long-term adaptive management, but may require the establishment of a new system (e.g. credit trading systems or markets, regulatory or administrative authorities). It is noteworthy that restoration activities conducted as part of regular production activities rather than as a formal project could also render valuable contributions to ecosystem restoration through the regenerative effects of SEPLS management (e.g. Chap. 7).

14.3.2 Way Forward: Opportunities for Synergistic Restoration

Landscape approaches offer an integrated scheme to collectively overcome the restoration challenges across different stakeholders, sectors, and levels, and to identify opportunities for synergies towards concerted efforts for restoration and sustainable development. Ways to exploit such opportunities lie in (1) multi-stakeholder participation and involvement, and (2) multi-lateral frameworks and coordination across different sectors and governance levels.

Multi-stakeholder Participation and Involvement

Bringing together multiple stakeholders on a common platform allows them to negotiate different needs and interests, share knowledge and learn from each other, be motivated to take action and mobilise resources, and finally collaborate on restoration. These stakeholders range from IPLCs, youth, women, and the private sector to government, scientists, and other experts. Each of them plays a key role in planning and implementing restoration efforts:

- *IPLCs*: Involvement of IPLCs in negotiation and decision-making for restoration is essential so that they can voice their needs and interests in regard to their rights and access to natural resource use as well as the environmental and socio-economic outcomes. This helps to ensure their livelihoods and well-being are secured and improved, while finding win-win solutions on the ground to attain multiple objectives (e.g. development of bio-cultural community protocols for livelihoods and conservation). It would also allow for the application of ILK to restoration and facilitate adaptive co-management based on lessons and experiences. Recording and documenting longstanding wise-use practices and ILK could be promoted and supported in consideration of the prehistoric role of indigenous peoples in managing SEPLS (e.g. ILK banks and global ILK support system). Yet, their intellectual property rights should be ensured, whereby cautious reflections are made for their participation in regard to time sensitivity

(e.g. considering the time constraints of the locals for participation), FPIC, equity, equal opportunities, and gender equality (e.g. Chaps. 10 and 13).

- *Youth and women*: For sustainability of restoration, youth involvement is critical so that efforts continuously benefit future generations. Particularly in Africa where youth (aged 18–35 years) account for 60–70% of the population (AfDB et al. 2017), their engagement in restoration has a great potential for significance. Also, involvement of women and explicit recognition of their roles in SEPLS management promotes gender parity and extends the project scale to include diverse perspectives in the restoration efforts. For instance, the involvement of women in the development of restoration activities at the Mole Ecological Area, Ghana, resulted in women’s effective engagement in managing a nursery that supplies seedlings of economically-important trees (e.g. *Parkia biglobosa* and *Vitellaria paradoxa*). These trees can be used for multiple purposes significant to the women, and thus were chosen as seedlings for restoring the degraded areas (Chap. 2). Participation by youth and women in restoration can be realised through unique and innovative approaches that can attract their attention, curiosity, and interest, while reflecting their specific needs. Such approaches can be applied to incentive creation (e.g. employment), communications (e.g. modern information technologies, social media, and traditional communication channels like community radio), and awareness raising and empowerment (e.g. dance, songs, street theatre, and poems) (see Chaps. 10, 12, and 13).
- *Private sector*: Involvement of the private sector (e.g. investors and private companies) in dialogues and decision-making can facilitate resource mobilisation and project implementation (e.g. Chap. 4), and enhance the financial sustainability of restoration, for instance, through public–private co-financing, payment for ecosystem services (PES) at the corporate level (linked to ecological footprint), and other forms of public–private partnerships. Impact investments may be linked to the products yielding from restored land and sea areas.
- *Government and administrative authorities*: Government engagement in restoration (particularly at the national level) allows for policymaking and implementation to address cross-boundary issues and deal with external forces (e.g. migration, climate change, and large-scale commercial fishing) (e.g. Chap. 3). At the same time, local authorities or traditional community-level institutions (e.g. district assemblies) can facilitate long-term bottom-up approaches to awareness raising, empowerment, resource mobilisation, and adaptive co-management for synergistic activities with keen attention to the well-being of local communities (e.g. taking advantage of interconnections between culture, ILK, ecotourism, climate action, agrobiodiversity, food security, and ecosystem restoration). For instance, Community Resource Management Committees (CRMCs) have served as a key local institution to facilitate mangrove restoration at two Ramsar sites in Ghana, which has contributed to both the conservation of aquatic biodiversity (e.g. birds and marine turtles) and the enhancement of community livelihoods through recruiting fisherfolks and promoting the use of fuel-efficient stoves by women for smoking fish (see Chaps. 9 and 13).

- *NGOs, scientists, and other experts*: Experts and professionals in NGOs, academia, and other organisations often serve as bridging stakeholders or facilitators to enable consultation and promote long-term cooperation across multiple stakeholders. Simultaneously, they may render their expertise in science, awareness raising, and community education, among others, to reinforce capacity development and resource mobilisation or develop new technological approaches to restoration interventions, monitoring, and evaluation. For instance, NGOs often play an indispensable role in bridging a gap between academia and local communities by strengthening mutual understanding and assisting in linking scientific knowledge with ILK (e.g. Chaps. 12 and 13).

Multi-lateral Frameworks and Coordination

To trigger and sustain a restoration initiative for sustainable development, the stakeholders need to feel motivated, agree on or if not negotiate their roles and responsibilities, collectively develop a plan, and collaborate for long-term adaptive co-management of natural resources. This process should be multi-lateral, iterative, and inclusive, and needs to be navigated by communicating and interacting with the stakeholders horizontally and vertically across different sectors and levels. For this to be achieved, the following three steps, which are not mutually exclusive, could be repeated and modified throughout the planning cycle:

- *Start from a landscape or seascape scale*:
From the perspective of a landscape or seascape, policymakers and practitioners can find context-specific issues, learn about relevant stakeholders and how they connect to each other, and select appropriate methods and approaches that suit a certain place for restoration. Communication with local stakeholders allows for a better understanding of the locals' everyday practices and associated value perspectives as well as potential opportunities for restoration and threats to sustainable practices. This helps policymakers and practitioners determine what should not be left out as critical elements and what is feasible for restoration. At the same time, such communication helps the locals to recognise the problems or threats to biodiversity and ecosystems that consequently affect their livelihoods and well-being (e.g. climate change impacts), and thus the importance of and need for restoration. As such, they are more motivated to take action and engage in restoration and more sustainable natural resource management (e.g. Chap. 4). This land/seascape-scale consultation can facilitate capacity development and resilience building in SEPLS, which can further help to ensure financial sustainability and long-term adaptive co-management of natural resources.
- *Promote peer learning and knowledge sharing*:
A platform or network for peer learning and knowledge sharing can serve to make a land/seascape-level restoration effort more effective and significant and help to upscale such an initiative for broader impacts. Such learning facilitates addressing multi-dimensional problems, and identifying and developing integrated solutions for restoration. This is because on the one hand, the factors associated with ecosystem degradation cannot be capsulated within the landscape

or seascape scale but are interlinked to internal and external drivers possibly leading to extensive consequences beyond a certain spatial and/or temporal scale. On the other hand, good practices can be replicated or adapted even in different contexts to address common challenges, where lessons learnt from a land/seascape-scale initiative or local solutions can inform decision-making and actions by other stakeholders.

A common platform for learning and sharing enables the stakeholders to conduct comparative analyses (which help to better address challenges and explore opportunities by identifying both similar and distinctive drivers across different landscapes and seascapes), learn lessons from not only successes but also failures (which tend to be underreported), raise awareness and understanding among diverse stakeholders, and tap into different resources and capacities for restoration (Chaps. 11 and 13). Such a platform could be held either online or physically to share and learn lessons among diverse stakeholders (e.g. local, regional, national, and international) and make different kinds of knowledge accessible and available to other users if appropriate—though the intellectual property rights of knowledge holders need to be carefully attended.

- *Institutionalise local solutions into coherent policies and frameworks:*

To move towards more sustainable futures, local restoration efforts need to be institutionalised for systemic change in human–nature interactions. Restoration initiatives on the ground can be incorporated (i.e. linked, upscaled, or mainstreamed) into higher-level plans and strategies in a coherent manner (e.g. policy frameworks across local, regional, and national levels). In this regard, a customary or traditional local governance system (which anchors SEPLS management) plays an essential role in steering restoration initiatives, while being coordinated with government institutions to allow for synergistic policymaking and implementation. Here, upstream and downstream connections should also be recognised along with clear, specific roles and responsibilities among stakeholders.

To develop such a coherent and comprehensive governance structure, global policy frameworks [e.g. UN Decade on Ecosystem Restoration, UN Decade on Ocean Science, UN Decade on Family Farming, other effective area-based conservation measures (OECMs)] can be drawn on to make local contributions more visible and recognisable at multiple levels towards achieving global goals for sustainability. Particularly for production activities (e.g. food production), supply chain frameworks can also be applied to identify interventions across different stages of value chains (e.g. production, distribution, retailing, and consumption) and integrate local restoration actions, from SEPLS management perspectives, into broader economic institutions where financial flows could be calibrated.

Furthermore, building on certain integrative concepts for sustainability (e.g. SEPLS, nature-based solutions, and ecosystem approach), multi-stakeholder networks, particularly with involvement of policymakers (e.g. IPSI), can be created and fostered at the international level (wherein national and regional coordination can help strengthen the network as appropriate). This would serve

to heighten the pride and motivation of local stakeholders, solicit wider interest and attention to local actions, and advocate for broader support. It would simultaneously help to raise local capacities for long-term commitment to meeting global goals for restoration and sustainable development.

14.4 Conclusion

Ecosystem restoration entails rehabilitating and rejuvenating ecosystems to ensure that their functional integrity is restored and sustained. Of special interest to this volume are also the implications this would have on biodiversity and the influence of (and on) cultural practices of people in SEPLS on achieving this goal. While engaging in activities that prevent, halt, and reverse degradation, it is important to address various drivers (whether natural or anthropogenic including economic, political, or social). Addressing these drivers involves attaining the cooperation of different actors and stakeholders with multiple priorities, responsibilities, and decision-making capacities. At the SEPLS level, this would typically involve engaging with local communities (and indigenous peoples), government bodies, resource management authorities, industrial bodies, and researchers.

The experiences from across different case studies illustrate that successful restoration activities are dependent on identifying potential trade-offs arising from various activities in a landscape or seascape. These trade-offs could occur within or between different scales of implementation, often privileging the interests of some dominant actors. Lessons from the case studies show that flexible, adaptive management strategies, which are developed by inclusive, participatory methods with a clear purpose building on existing assets (such as natural resources, knowledge and sustainable resource use practices, and human resources), are most likely to lead to successful restoration outcomes. Innovative use of digital technology to share information, raise awareness, and access knowledge and external networks complements this approach along with a variety of incentives from carbon credits, and awards for good practice, among many others.

Nevertheless, operationalising restoration activities are affected by various challenges that range from political will and capacity asymmetries relating to information and resources, to power asymmetries between sectors and actors, among others. Addressing these requires synergising across various sectoral initiatives, enabling deliberative processes, developing capacities related to understanding social-ecological underpinnings of restoration activities, and further integrating land/seascape-level solutions to policy interventions. Leveraging existing sectoral policy initiatives with potential for collaboration with other sectors allows for more effective use of various resources (financial, human, natural), enhances better understanding of the potential outcomes of different interventions, and fosters better outcomes for people and nature.

The UN Decade on Ecosystem Restoration and similar efforts provide a much-needed political impetus to advance such approaches. Hopefully, these initiatives will translate into focused investments (financial, technical, and human resources) in capacity development and research, and training and peer learning efforts that are mindful of advancing social-ecological resilience and enable restoration goals to be achieved.

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