# Chapter 1
# Introduction


**Maiko Nishi, Suneetha M. Subramanian, Himangana Gupta, Madoka Yoshino, Yasuo Takahashi, Koji Miwa, and Tomoko Takeda**

**Abstract** This chapter introduces the idea of transformative change for sustainability and its relevance to the concept and practices of socio-ecological production landscapes and seascapes (SEPLS). First, it lays out the context where transformative change has been described as a way of fundamental, system-wide reorganisation of technological, economic and social factors to achieve the global goals of sustainability and nature conservation. Following a literature review, which offers the current state of knowledge concerning transformative change, the chapter discusses how SEPLS management relates to the idea of transformative change. In particular, it highlights the potentials of integrated approaches to managing SEPLS that can result in multiple benefits beyond biodiversity conservation and facilitate transformative change while addressing well-being needs and challenges specific to the local contexts. With this background and conceptual underpinning, the chapter provides the scope and objectives of the book as well as the key questions followed by the case study chapters. Finally, it introduces the organisation of the book and presents an overview of the case studies.

**Keywords** Socio-ecological production landscapes and seascapes · Transformative change · Sustainable pathways · Systemic change · Landscape approaches · Case studies · Science-policy-practice interface · Sustainable development · Biodiversity conservation

M. Nishi (✉) · H. Gupta
United Nations University Institute for the Advanced Study of Sustainability (UNU-IAS), Tokyo, Japan
e-mail: nishi@unu.edu

S. M. Subramanian · M. Yoshino
United Nations University Institute for the Advanced Study of Sustainability (UNU-IAS), Tokyo, Japan

Institute for Global Environmental Strategies (IGES), Hayama, Japan

Y. Takahashi · K. Miwa · T. Takeda
Institute for Global Environmental Strategies (IGES), Hayama, Japan



M. Nishi et al. (eds.), *Fostering Transformative Change for Sustainability in the Context of Socio-Ecological Production Landscapes and Seascapes (SEPLS)*,
https://doi.org/10.1007/978-981-33-6761-6_1

## 1.1 What Do We Know About Transformative Change for Sustainability?

The idea of "transformative change" has been gaining more attention as something that is needed to deal with today's environmental and developmental problems. The 2030 Agenda for Sustainable Development advocates taking "the bold and transformative steps which are urgently needed to shift the world on to a sustainable and resilient path" (UN 2015, p. 3). The Intergovernmental Panel on Climate Change (IPCC) Special Report on the impacts of global warming of 1.5 °C calls for "transformative systemic change, integrated with sustainable development" (IPCC 2018, p. 40). The Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) Global Assessment Report, launched in May 2019, also cautions that goals for conserving and sustainably using nature and achieving sustainability, including the 2030 Agenda for Sustainable Development and the 2050 Vision for Biodiversity, cannot be met by ongoing trajectories. It thus urges "transformative changes across economic, social, political and technological factors" in order to achieve these goals for 2030 and beyond (IPBES 2019a, p. 33).

But what does "transformative change" mean? According to IPBES, it refers to "[a] fundamental, system-wide reorganization across technological, economic and social factors, including paradigms, goals and values" (IPBES 2019a, p. 14). The IPBES global assessment conceptualises the governance of transformative change as shown in Fig. 1.1. Direct drivers, including changes in land and sea use, direct exploitation, climate change, pollution, and invasion of alien species, are the result of indirect drivers such as demographic and sociocultural factors, economic and technological aspects, institutions and governance, disasters, conflicts, and epidemics. Both direct and indirect drivers have been accelerated over the past 50 years. Five main interventions, or levers, are proposed to generate transformative change: (1) incentives and capacity building; (2) cross-sectoral cooperation; (3) pre-emptive action; (4) decision-making in the context of resilience and uncertainty; and (5) environmental law and implementation. Also, eight priority points of intervention have been found as leverage points that are likely to yield large impacts: (1) visions of a good life; (2) total consumption and waste; (3) values and action; (4) inequalities; (5) justice and inclusion in conservation; (6) externalities and telecouplings; (7) technology, innovation and investment; and (8) education and knowledge generation and sharing.

This concept of transformative change builds on a synthesis of diverse strands of the literature, in which systemic change is a common subject. As described above, the notion of systemic change is also implicitly expressed in the synonymous terms used by other international processes such as IPCC (e.g. transformative systemic change). In the literature, the process of systemic change is, for instance, characterised as a complex web of fast and slow developments cumulatively resulting from positive and negative feedback mechanisms (Edmondson et al. 2019; Grin et al. 2010). In a successful transition, a new system adapts to the changed internal and external circumstances and arrives at a higher degree of

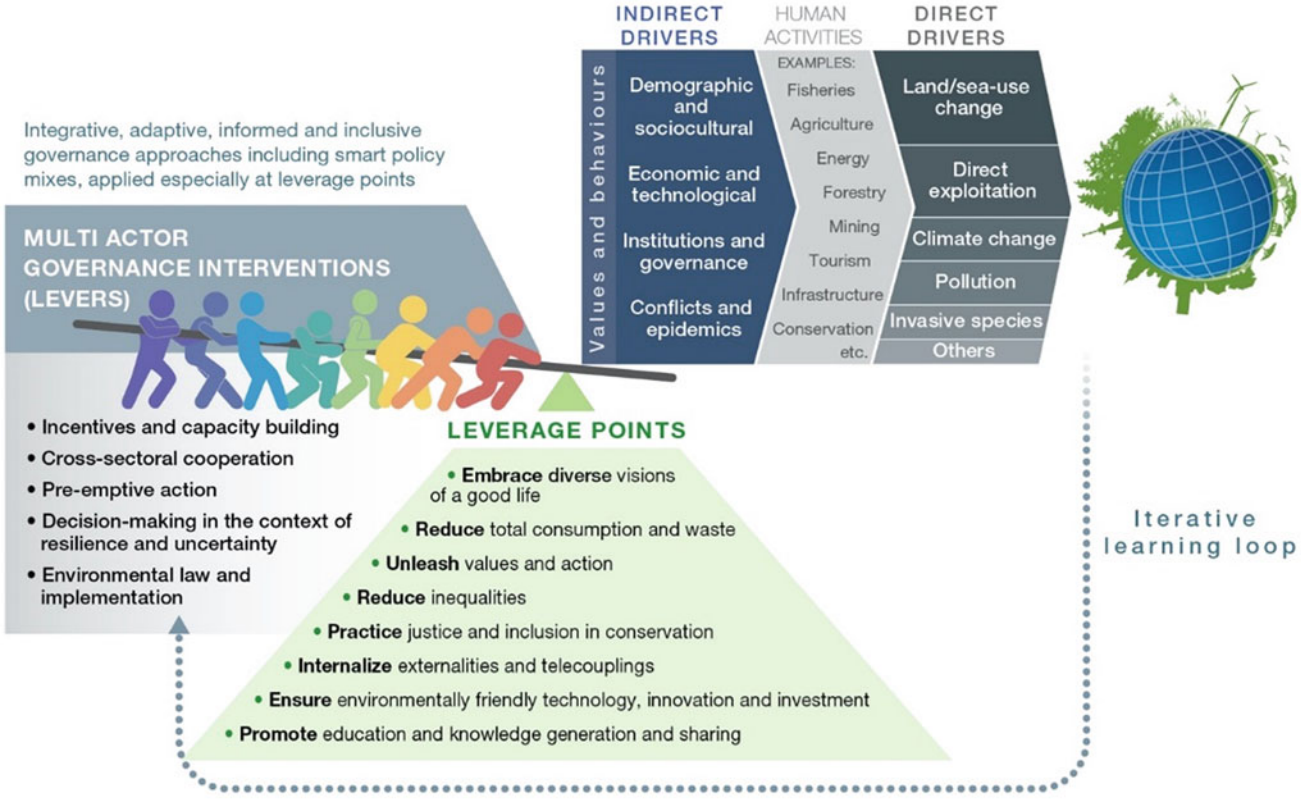


**Fig. 1.1** Transformative change in global sustainability pathways (IPBES 2019a)

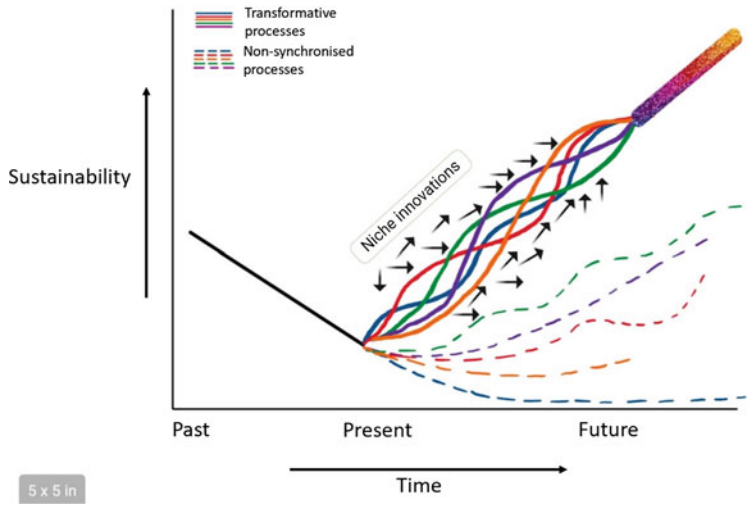


**Fig. 1.2** Conceptual schematic of transformative change. Adapted from IPBES (2019a), Grin et al. (2010), Rotmans and Loorbach (2009) and Geels (2005)
Note: Over time (X axis), the level of sustainability (Y axis) has declined as exemplified by the trends related to biodiversity and other sustainability indices (IPBES 2019a). The figure depicts two broad potential scenarios in achieving sustainability goals moving from now towards the future—let us say 2050–, depending on the pathways adopted: (1) the pathways of transformative processes, and (2) the pathways of non-synchronised processes. In the transformative processes, each of the sectoral pathways (colored, solid lines, exemplifying different pathways in various sectors such as agriculture, tourism, fisheries, etc.) will undergo internal transformation involving positive and negative feedback mechanisms shown as non-linear and dynamic pathways (fluctuated) but will overall move towards higher levels of sustainability (moving upward remarkably). At the same time, these different pathways will influence and bolster each other to become harmoniously synchronised, whereas emerging niche agents stimulate niche development at the micro-level and cumulatively lead to niche innovations. Overall, these internal and external developments lead to bringing about transformative change (rainbow-colored, bold line). In the non-synchronised processes, some of the pathways (colored, dotted lines) will go through internal transformation (fluctuated), but others will not reflect positive and negative feedbacks much in their own systems (less fluctuated). While achieving varied levels of sustainability, the different interventions will be undertaken separately without synergistic effects and thus these pathways will not intersect and interact with each other in a synchronised manner, failing to bring about transformative change

complexity encompassing various organisational levels and multiple sectors (Rotmans and Loorbach 2009). For instance, a policy mix drives socio-technical change through multiple policy effects while leading to further policy mix advancement by influencing the policy processes along with the resultant feedback mechanisms (Edmondson et al. 2019).

Figure 1.2 describes a concept of this feedback process as possible pathways from present to future. In the transformative processes, positive and negative feedbacks inform and influence each other in a synchronised manner, strengthening the system in itself. Conversely, the non-synchronised processes involve a weaker feedback mechanism, leading to a limited level of sustainability or even ending up with a

collapse of the system earlier. Taking food policy as an exemplary intervention, the food production system may be improved towards sustainability through various changes and actions including organic farming practices, entrepreneur initiatives, and consumers' reactions and feedbacks, but if it lacks synergy and consonance between different interventions, it might not reach a high level of sustainability, for instance, as expected to achieve the 2050 Vision for Biodiversity. Finally, adapting to internal and external changes that interact with each other—including policy innovations across different sectors, technological advancement, broad socio-economic changes, and environmental changes—would reinforce the system in question along with the development of other interventions, resulting in a new system that has arrived at a higher order of complexity involving multiple social organisations across different levels. For instance, this could be manifested as mainstreaming of biodiversity into agriculture, forestry, fisheries, tourism, business and industries, and many other sectors at multiple levels. The transformative processes thus enable achievement of ambitious global goals and targets.

Current status quo systems often inhibit sustainable development and sometimes constitute or exacerbate indirect drivers of biodiversity loss (IPBES 2019a). When an incumbent system reaches equilibrium, various factors impede internal forces to change the system (Grin et al. 2010). For instance, the food production system may not entail dynamic feedback mechanisms within the system or may not interact with other policy sectors to move towards sustainability. It is often the case that policymaking is pursued within one sector only at the national level, whereas no feedback mechanism is devised to incorporate inputs into and provide feedbacks from other sectors and levels. This results in not only a failure in bringing about transformative change, but sometimes leads the society to a further unsustainable future.

Nevertheless, newcomers or small groups of emerging niche agents (i.e. agents of change giving rise to niche innovations, such as environmental champions, local communities, and other non-state actors featured in the following case study chapters), who are yet to be absorbed into the incumbent equilibrium of systems, have the potential to break through conventional systems and establish new regimes with a set of dynamics that are better adapted to the changed environment or circumstances (Rotmans and Loorbach 2009). This multilateral process involves a multi-level perspective (MLP) which specifically attends to the interactions between macro-, meso- and micro-levels in system transition (Geels 2005). At the micro-level, a wide array of innovations emerge in niches and are gradually aligned and linked together to form a new configuration of social and technological elements. A change in the socio-technical landscape at the macro-level causes a misfit of a system pertinent to the existing regime, and thereby opens up an opportunity for a regime shift. A system transformation occurs when a new socio-technical configuration that addresses the system misfit links up to (or 'anchors') and penetrates throughout the regime.

To bring about transformative change, 'intermediaries' play a key role in facilitating collaboration among diverse stakeholders (Klerkx et al. 2012). In the final process of system transformation, 'scaling' of innovation occurs. Moore et al. (2015) postulate the notion of scaling out, up, and deep. Scaling-out is an attempt to impact

greater numbers through deliberate replication and spreading principles; scaling-up is an effort to change laws, rules and policy; and scaling-deep is intended to change mindsets. Moore et al. (2015) highlight the need to integrate these three approaches, rather than focusing on one among others, to induce system-wide change.

As a means of inducing change, the notion of leverage points has developed, originating from the Meadows' theory (Meadows 1999), which describes 'shallow' and 'deep' leverage points to induce system-wide transformative change. Shallow leverage points are tangible and thus often the subject of policy interventions, but not strong enough to yield a system-wide transformation (Abson et al. 2017). These include parameters pertaining to production, flow and stock of substances and their structure, as well as the feedback mechanisms that are in place to regulate these parameters. Deep leverage points are mostly intangible and hard to alter but can bring about extraordinary impact once effectively addressed. These include system design, i.e. the structure of information flows, the rule of the system and the power to change or create system structure, as well as the intent of the system, including the goals of the system and the paradigm which the system serves. Abson et al. (2017) identified three realms that exert effects on these deep leverage points and thereby effectively contribute to sustainability transformation: institutions, people's connections to nature, and the production and use of knowledge in transformative change processes.

The IPBES global assessment illustrates plausible global pathways to sustainability, which are coherent with known constraints on economics, resource use and human development goals, but require transformative change as fundamental changes in development paradigms (IPBES 2019b). While exploring a (more) sustainable future that may unfold in a context-dependent and evolutionary manner with emergent properties (rather than in a deterministic and linear way), it highlights that implementation of instruments through integrative, informed, inclusive and adaptive place-based governance interventions can enable global transformation (IPBES 2019c). Furthermore, it points to a diversity of actors at multiple leverage points—ranging from intergovernmental organisations, governments, non-governmental organisations, and indigenous peoples and local communities to the private sector—who can apply the levers. Even after the launch of the IPBES global assessment, however, many assessment authors repeatedly received a question about "[w]hat does transformative change mean, and how do we get started?"—most probably due to the insufficient recognition or understanding of the links between theories and practices for bringing about transformative change (Chan 2019).

In view of the need for a better understanding of how transformative change can be brought about to inform development of policies and actions, IPBES decided in early 2019 to conduct a thematic assessment of the underlying causes of biodiversity loss and the determinants of transformative change and options for achieving the 2050 Vision for Biodiversity, the so-called "assessment on transformative change" as part of its rolling work programme (IPBES 2019d). Considering broader social and economic goals in the context of sustainable development, this assessment is aimed at understanding and identifying factors in human society at both the

individual and collective levels—including behavioural, social, cultural, economic, institutional, technical and technological dimensions—which can be leveraged to bring about transformative change for the conservation, restoration and wise use of biodiversity (IPBES 2019b). The three-year assessment work will be launched upon the eighth session of the IPBES Plenary to be held in the near future. A recent review of the studies on sustainability transformation also identified a lack of empirical knowledge on its real-world examples (Salomaa and Juhola 2020). As such, knowledge concerning transformative change in connection to biodiversity and ecosystem services is yet to be assessed globally in a comprehensive manner, particularly with reference to practical examples.

## 1.2 Potential Contributions of Socio-Ecological Production Landscapes and Seascapes to Transformative Change

As a system-wide reorganisation that is needed for humanity to achieve global goals related to nature, transformative change requires consideration of the relationships and linkages between SDGs, targets towards the 2050 Vision for Biodiversity, and the Paris Agreement on climate change, and between related conventions like the Convention on Biological Diversity (CBD), United Nations Framework Convention on Climate Change (UNFCCC) and United Nations Convention to Combat Desertification (UNCCD). Interlinkages exist inherently between different global environmental problems across scales and levels given the complex interdependency of food, water, and energy among competing uses, which are further compounded by climate change (Rasul and Sharma 2016). While the nexus among multiple ecosystem services is gaining prominence as a methodological approach to resource management so as to address sustainability challenges and improve policymaking, these problems cannot be resolved without local actions (Cremades et al. 2019; Rasul and Sharma 2016).

The Satoyama Initiative promotes integrated approaches with a focus on the locally or regionally based revitalisation and management of socio-ecological production landscapes and seascapes (SEPLS). Being portrayed as a mosaic of various types of ecosystems (e.g. farmlands, secondary forests, wetlands, coastal zones and human settlements), SEPLS refer to the areas where production activities help maintain biodiversity and ecosystem services in various forms while sustainably supporting the livelihoods and well-being of local communities. Nature provides multiple benefits for people (e.g. material goods and spiritual inspiration) through biophysical processes and ecological interactions with anthropogenic assets (e.g. knowledge, infrastructure, technology and institutions) not only at the local level but across a wide range of communities (IPBES 2019a).

However, multiple human drivers, including both direct and indirect ones, have increasingly and significantly altered nature (e.g. land surface, ocean and wetlands) during the past 50 years, accelerating the rate of species extinction and devastating

global ecosystems (IPBES 2019a). This in turn threatens a good quality of life through the degradation of nature's contributions to people and undermines efforts to achieve many of the international societal and environmental goals (IPBES 2019a). It is important to note that SEPLS, which are purposively managed to produce multiple ecosystem services, contribute directly to the well-being of local communities but also to that of a larger population outside their boundaries, thereby supporting local, national and global economies (Gu and Subramanian 2014). At the same time, the production processes within SEPLS are increasingly subject to external demands and pressures and influenced by policy decisions at the national and international levels (Gu and Subramanian 2014).

Integrated approaches to managing SEPLS can result in multiple benefits beyond biodiversity conservation, including provision of ecosystem services, preservation of traditional knowledge and practices, climate change mitigation and adaptation, ecosystem restoration, and social equity and rights. SEPLS management manifests integrated approaches on a landscape or seascape scale (often called landscape approaches), which offer opportunities to reconcile multiple interests, values, and forms of resource use. In particular, these approaches help deliberate sustainable pathways by bringing together diverse stakeholders operating on the landscape or seascape, specifically recognising trade-offs and power asymmetries among them (IPBES 2019a; Sayer et al. 2017).

As small groups of niche agents have the potential to make a breakthrough for transformative change (Grin et al. 2010), good practices at the local level are critical to achieve global goals. In fact, as demonstrated in the previous volumes of the Satoyama Initiative Thematic Review (SITR) from 2015 to 2019, the Satoyama Initiative involves many case studies showing how these approaches contribute to global goals through local actions by bringing together all the different concerns and interests in the landscape or seascape. These cases can be seen as real-world examples of transformative change or the seeds for it. SEPLS management could thus provide practical and experience-based insights for understanding and gauging transformative change and identifying determinants of such change. Furthermore, multi-level networks such as the International Partnership for the Satoyama Initiative (IPSI), which can link an array of locally-relevant solutions across ecosystems and scales, help promote new actions and policy in response to challenges and opportunities to achieve biodiversity conservation, ecosystem restoration and more broadly sustainable development (Kozar et al. 2019). Given that transformative change has been called for in policymaking and implementation processes as mentioned above, exploring the contributions of SEPLS to transformative change would also have strong policy significance for the achievement of relevant global goals.

## 1.3 Objectives and Structure of the Book

The primary focus of this book is the relevance of SEPLS to transformative change. The book aims to provide insights on how SEPLS management on the ground can contribute to more sustainable management and achievement of global goals for sustainable development through bringing about transformative change. Considering integrated approaches to SEPLS management can deliver multiple benefits for people and the planet, this volume brings together case studies on SEPLS management from different regions around the world, which delve into the relevance of SEPLS to various aspects of transformative change. The case studies highlight the roles, attitudes and actions of those responsible for management, including smallholders, indigenous peoples and local communities, and other stakeholders in conserving biodiversity while ensuring that SEPLS provide other benefits (e.g. food security, water quality, health, quality of life, enhanced carbon storage, reduced footprint of cities). Furthermore, they attend to how SEPLS management may have implications for national and global policymaking processes.

In particular, the case studies address the following questions:

- How has SEPLS management helped in pursuing transformative change or leading to the emergence (i.e. seeds) of transformative change?
- What indicators and methods are used to assess the achievements for transformative change?
- What are the roles, attitudes and actions of those responsible for management, including smallholders, indigenous peoples and local communities, in facilitating transformative change while ensuring the multiple benefits from SEPLS? In this regard, are there any policy implications at the local, regional, national and/or global levels?
- What are the values underpinning SEPLS management and how do they contribute to bringing about transformative change for improved sustainability?
- What are the challenges and opportunities in bringing about transformative change towards a sustainable world through SEPLS management?

The following Chaps. 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, and 12 present eleven case studies from different parts of the world, including two from Africa, four from Asia, three from Europe, and two from Latin America (Fig. 1.3). Although each of the case studies features SEPLS that encompass different types of ecosystems, the case studies are largely grouped into dominant landscapes or seascapes as follows: (1) mountain landscapes (Chaps. 2, 3, 4, and 5); (2) agricultural landscapes (Chap. 6); (3) watershed landscapes (Chaps. 7, 8, 9, and 10); and (4) coastal landscapes or seascapes (Chaps. 11 and 12) (Table 1.1). Most of the cases primarily focus on the efforts of SEPLS management at the local level, including those in one or multiple local communities (Chaps. 2, 3, 4, 5, 6, 10, and 11) or a certain catchment or a bay area (Chaps. 7, 9 and 12), while some of them have scaled up to national-scale initiatives or have been replicated in other regions. One exception is a cross-scale comparison between local and regional initiatives (Chap. 8). The time scale of


**Fig. 1.3** Locations of the case studies by types of landscapes (Map template: Geospatial Information Section, United Nations)
Note: Details of the case study locations, including geographic coordinates, are described in each chapter

**Table 1.1** Overview of the case studies

| Focused landscape or seascape | Chapter (Country) | Location and ecosystem type | Spatial scale or jurisdictional level[a] | Temporal scale[b] | Problems | Objectives |
|---|---|---|---|---|---|---|
| Mountain landscapes | Chapter 2 (Kenya) | Mountain forest, farmland | Forest fragments (Taita Hills landscape, 5 forests surrounded by villages: 769.8 ha) | 2012–2019 | • Environmental: forest degradation and its adverse effect on water resources, habitat reduction, loss of flora and fauna diversity, soil erosion<br>• Social: poverty, food insecurity, societal conflicts | Forest restoration, livelihood improvement, participatory management, climate change mitigation and adaptation |
| | Chapter 3 (Madagascar) | Mountain forest, farmland | Village (principal village Ambondro and 5 other villages: 4680 ha) | 2013–2020 | • Environmental: deforestation, biodiversity loss, habitat reduction<br>• Social: food insecurity, poverty, population growth (insufficiency of food production, shortage of raw materials)<br>• Political: corruption | Agroforestry landscaping, local reforestation with indigenous species, forest restoration, food production, livelihood improvement |
| | Chapter 4 (India) | Mountain forest, farmland, pasture | Village (Khaljuni village: including 68 ha farms and 436 ha forest) | 1991–2016 | • Environmental: farmland abandonment, forest degradation | Forest restoration, biodiversity conservation, climate change mitigation |
| | Chapter 5 (Nepal) | Mountain forest, farmland | Four villages (in four municipalities in Gandaki Province) | 2015–2019 | • Environmental: landslides, climate change-related hazards, farmland abandonment<br>• Social: food insecurity, | Livelihood improvement, improved ecosystem services (water availability and retention, food production), |

(continued)

**Table 1.1** (continued)

| Focused landscape or seascape | Chapter (Country) | Location and ecosystem type | Spatial scale or jurisdictional level[a] | Temporal scale[b] | Problems | Objectives |
|---|---|---|---|---|---|---|
| | | | | | financial stress, rural youth outmigration | biodiversity conservation |
| Agricultural Landscapes | Chapter 6 (Italy) | Farmland (hilly terrain) | Town (Montespertoli in Florence metropolitan area: approx. 12,000 ha) | 2013–2020 (project started in 2014) | • Environmental: farmland abandonment, unsustainable agriculture, loss of species diversity<br>• Social: decline in agricultural activities (e.g. town fairs, festivals), decrease in farming population | Sustainable agriculture, reduced carbon footprint, reduced landslides and waste, biodiversity conservation, livelihood improvement (farmers' revenues), improved health |
| River-basin/ watershed Landscapes | Chapter 7 (Chinese Taipei) | Upstream watershed, farmland (hillside, slope land) | Upstream community (Han River upstream watershed: 250 ha containing 100 ha farmlands and 80 ha foothills) | 2012–2019 | • Environmental: low water retention capacity, uneven rainfall pattern, water shortage (overuse of groundwater)<br>• Social: aging labour force, rural youth outmigration, water-use conflicts | Landscape restoration, sustainable local economy, improved water management, biodiversity conservation, community empowerment |
| | Chapter 8 (Spain) | Peri-urban watershed, forest (peri-urban), riparian and coastal zones (peri-urban) | • Regional: autonomous community of Galicia (2958 ha)<br>• Local: neighbourhood association of Chapela in Galicia (975 ha) | 2017–2019 | • Environmental: pollution, increased ecosystem vulnerability (riparian and forest)<br>• Social: decreased access to green infrastructure, mobility limitations | Green infrastructure development, biodiversity conservation, pollution reduction, improved air quality, improved hydrological regulations, landscape quality, |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | | | | (access to public transportation and pedestrian mobility) | sense of place, cultural heritage linked to ecosystems |
| | Chapter 9 (United Kingdom) | Upstream watershed, forest, farmland, pasture, wetlands | Upstream catchment (Upper Thames catchment: 26,000 ha including 19 parish councils and 22,000 ha of farmland) | 2013–2016 | • Environmental: water pollution, flooding | Improvement of water quality, community empowerment |
| | Chapter 10 (Colombia) | Downstream watershed, lowland forest, riparian and coastal zones | Ethnic community (San Marcos: 3689 ha) | 2013-2020 | • Environmental: ecosystem degradation (woodland exploitation, mining, dam construction)<br>• Social: poverty, loss of cultural identity, lack of education, social conflicts (illegally-armed groups, drug trafficking) | Biodiversity conservation, sustainable natural resource use |
| Coastal landscapes or seascapes | Chapter 11 (Philippines) | Coast (rural), mangroves, downstream watershed | Village (Alitas, an estuarine barangay: 676 ha, including 355 ha of mangrove forest) | 2013–2020 | • Environmental: climate change-related hazards<br>• Social: impacts on coastal livelihoods and well-being | Enhanced local resilience to climate change, mangrove conservation |
| | Chapter 12 (Antigua and Barbuda) | Coast (urban), marine, island, watershed (urban, peri-urban, and rural) | Bay flashes (Hanson's Bay Flashes—Key Biodiversity Area in St. John's City: 20 ha) | 2018–2020 | • Environmental: water and marine pollution, solid waste mistreatment, risks to human health<br>• Political: lack of policy for waste control | Waste reduction and recycling, awareness raising and capacity development for recycling, livelihood improvement |

[a]Refers to study sites or an area where the initiative of SEPLS management was primarily conducted, although some diffusive effect on surrounding areas or replication in other regions was observed in several cases (e.g. Chaps. 5, 6 and 12)
[b]Refers to the period of time during which changes were observed and analysed for each case study

the changes observed in the case studies ranges from the last few years (Chaps. 8, 9, and 12) and 5–10 years (Chaps. 2, 3, 5, 6, 7, 10, and 11) to more than two decades (Chap. 4). All the cases illustrate unique initiatives to address particular environmental problems (e.g. ecosystem degradation, habitat loss, and pollution) but often in combination with social problems (e.g. poverty, food insecurity, demographic decline and social conflicts), whereas political problems (e.g. corruption, lack of control) sometimes inhibit resolution or exacerbate the social and ecological problems. Importantly, many of the cases exemplify initiatives not only to address the immediate problems but to collectively identify long-term solutions and ensure continuous delivery of multiple benefits from SEPLS.

With the general understanding of transformative change (i.e. a fundamental, system-wide reorganisation as defined by IPBES), the case studies commonly address the above key questions to elucidate the relevance of each SEPLS management to aspects of transformative change. As a concluding chapter, Chap. 13 synthesises key findings from the case studies and draws out key messages to offer implications for science, policy and practice as well as their interfaces in moving towards a sustainable world. By revisiting the existing conceptual frameworks described in this chapter, the last chapter re-examines the concept of transformative change. As discussed in Chap. 13, most of the case studies demonstrate seeds of change that have great potential to facilitate and pursue sustainable transformation, while highlighting challenges and opportunities to bring about transformative change as a groundbreaking system-wide transformation. Despite the limitations in terms of extent, scope and depth of change, the case studies offer critical insights to elaborate the concept of transformative change and advance methodologies for monitoring and evaluation on progress in pursuing transformative change.

## References

Abson, D. J., Fischer, J., Leventon, J., Newig, J., Schomerus, T., Vilsmaier, U., von Wehrden, H., Abernethy, P., Ives, C. D., Jager, N. W., & Lang, D. J. (2017). Leverage points for sustainability transformation. *Ambio, 46*, 30–39.

Chan, K. (2019). What is transformative change, and how do we achieve it? *IPBES News*. Retrieved 28 July, 2020, from https://ipbes.net/news/what-transformative-change-how-do-we-achieve-it

Cremades, R., Mitter, H., Tudose, N. C., Sanchez-Plaza, A., Graves, A., Broekman, A., Bender, S., Giupponi, C., Koundouri, P., Bahri, M., Cheval, S., Cortekar, J., Moreno, Y., Melo, O., Karner, K., Ungurean, C., Davidescu, S. O., Kropf, B., Brouwer, F., & Marin, M. (2019). Ten principles to integrate the water-energy-land nexus with climate services for co-producing local and regional integrated assessments. *Science of The Total Environment, 693*, 133662.

Edmondson, D. L., Kern, F., & Rogge, K. S. (2019). The co-evolution of policy mixes and socio-technical systems: Towards a conceptual framework of policy mix feedback in sustainability transitions. *Research Policy, 48*(10).

Geels, F. W. (2005). Processes and patterns in transitions and system innovations: Refining the co-evolutionary multi-level perspective. *Technological Forecasting and Social Change, 72*, 681–696.

Grin, J., Rotmans, J., & Schot, J. (2010). Transitions to sustainable development: New directions in the study of long term transformative change.

Gu, H., & Subramanian, S. M. (2014). Drivers of change in socio-ecological production landscapes: Implications for better management. *Ecology and Society, 19*.

IPBES. (2019a). *Summary for policymakers of the global assessment report on biodiversity and ecosystem services of the intergovernmental sciencepolicy platform on biodiversity and ecosystem services* (pp. 56). In S. Díaz, J. Settele, E. S. Brondízio, H. T. Ngo, M. Guèze, J. Agard, A. Arneth, P. Balvanera, K. A. Brauman, S. H. M. Butchart, K. M. A. Chan, L. A. Garibaldi, K. Ichii, J. Liu, S. M. Subramanian, G. F. Midgley, P. Miloslavich, Z. Molnár, D. Obura, A. Pfaff, S. Polasky, A. Purvis, J. Razzaque, B. Reyers, R. Roy Chowdhury, Y. J. Shin, I. J. Visseren-Hamakers, K. J. Willis, & C. N. Zayas (Eds.). Bonn, Germany: IPBES Secretariat.

IPBES. (2019b). Next work programme of the Platform, IPBES/7/6.

IPBES. (2019c). *Global assessment report on biodiversity and ecosystem services of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services*. Bonn, Germany: IPBES Secretariat.

IPBES. (2019d). Rolling work programme of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services up to 2030, Decision IPBES-7/1.

IPCC. (2018). Global Warming of 1.5°C: An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty. In V. Masson-Delmotte, O. Zhai, H.-O. Pörtner, D. Roberts, J. Skea, P. R. Shukla, A. Pirani, W. Moufouma-Okia, C. Péan, R. Pidcock, S. Connors, J. B. R. Matthews, Y. Chen, X. Zhou, M. I. Gomis, E. Lonnoy, T. Maycock, M. Tignor, & T. Waterfield (Eds.). https://www.ipcc.ch/site/assets/uploads/sites/2/2019/05/SR15_Citation.pdf

Klerkx, L., van Mierlo, B., & Leeuwis, C. (2012). Evolution of systems approaches to agricultural innovation: Concepts, analysis and interventions. In I. Darnhofer, D. Gibbon, & B. Dedieu (Eds.), *Farming systems research into the 21st century: The new dynamic* (pp. 457–483). Dordrecht: Springer.

Kozar, R., Galang, E., Alip, A., Sedhain, J., Subramanian, S., & Saito, O. (2019). Multi-level networks for sustainability solutions: The case of the International Partnership for the Satoyama Initiative. *Current Opinion in Environmental Sustainability, 39*, 123–134.

Meadows, M. (1999). *Leverage points: places to intervene in a system*. Hartland, VT: The Sustainability Institute.

Moore, M.-L., Riddell, D., & Vocisano, D. (2015). Scaling out, scaling up, scaling deep strategies of non-profits in advancing systemic social innovation. *Journal of Corporate Citizenship, 2015*, 67–84.

Rasul, G., & Sharma, B. (2016). The nexus approach to water–energy–food security: An option for adaptation to climate change. *Climate Policy, 16*, 682–702.

Rotmans, J., & Loorbach, D. (2009). Complexity and transition management. *Journal of Industrial Ecology, 13*, 184–196.

Salomaa, A., & Juhola, S. (2020). How to assess sustainability transformations: A review. *Global Sustainability, 3*, e24.

Sayer, J. A., Margules, C., Boedhihartono, A. K., Sunderland, T., Langston, J. D., Reed, J., Riggs, R., Buck, L. E., Campbell, B. M., Kusters, K., Elliott, C., Minang, P. A., Dale, A., Purnomo, H., Stevenson, J. R., Gunarso, P., & Purnomo, A. (2017). Measuring the effectiveness of landscape approaches to conservation and development. *Sustainability Science, 12*, 465–476.

UN. (2015). *Transforming our world: The 2030 agenda for sustainable development, A/RES/70/1*. New York, NY: UN.

The opinions expressed in this chapter are those of the author(s) and do not necessarily reflect the views of UNU-IAS, its Board of Directors, or the countries they represent.