

Strengthening Resilience of Socio-Ecological Production Landscapes and Seascapes: An Indicators Approach for Local Communities

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Resilience of production landscapes for sustainable development

As the world looks forward to the introduction of the United Nations' Sustainable Development Goals (SDGs) in 2015, it is obvious that more efforts toward implementation are required in order to protect the environment that supports humans' survival and well-being. Many global issues we are facing today, such as poverty, food insecurity and freshwater scarcity, are linked to environmental degradation arising from misuse of land and natural resources. Maintaining a healthy environment through appropriate management of natural resources is essential to the well-being of current and future generations.

In areas where people interact directly with nature through farming, fishing and collecting resources from forests and other ecosystems, local communities have played vital roles in maintaining sustainable landscapes and seascapes. Through their close interactions with nature, they have developed ways of living and producing food and other materials in an efficient and sustainable manner through adaptation to, and sometimes modification of, the surrounding environment (e.g., Ichikawa 2012; Bélair et al 2010). Landscapes and seascapes with this type of interaction have been termed "socio-ecological production landscapes and seascapes" (SEPLS) (IPSI Secretariat, 2012).

SEPLS benefit human well-being by providing a bundle of ecosystem services derived from a diverse mosaic of land uses supported by sustainable use. They contribute to creating sustainable societies, as they encompass production activities that maintain both biodiversity and ecosystem services. However, with the growing human population as well as changes in socio-economic systems due to industrialization, urbanization and globalization, SEPLS around the world have been transformed into urban landscapes or homogenous production systems that require excessive inputs of, for example, agrochemicals that have significant impacts on the associated biodiversity and ecosystems that underpin ecosystem services (e.g., Duraiappah et al 2012; Gu and Subramanian 2014).

With SEPLS facing these threats, the concept of resilience is a useful and important one for their restoration and conservation. Ecosystems by nature experience various kinds of shocks and disturbances such as storms, droughts, wildfires and earthquakes. Likewise, societies encounter various pressures and

changes caused by events including economic crises and political unrest in addition to natural disasters. These directly and indirectly affect the livelihoods of local communities through, for example, reduced production, higher input prices and lower crop prices. Further, gradual and continuous changes such as climate change and socio-cultural and institutional transition also influence local communities.

It is important to ensure that SEPLS can withstand and absorb these shocks and changes and recover from the damage caused by them; in other words, to maintain SEPLS with strong resilience. According to the Stockholm Resilience Center (2014), “resilience” refers to “the capacity of a system to deal with change and continue to develop; withstanding shocks and disturbances and using such events to catalyze renewal and innovation”. Maintaining resilience in SEPLS is crucial for securing ecosystem services and sustainable production systems for the long term, benefiting local communities and contributing to creation of sustainable societies.

While various efforts need to be undertaken at all levels to reverse negative trends in SEPLS, efforts at the local level by local communities themselves are vital in that the communities are the primary users and managers of the natural resources in their landscapes and seascapes. They are also the ones who, based on regular and close interaction with nature, possess abundant information on how ecosystems react to different management practices, recover from natural disasters, and change over the long term. It is thus important to recognize and promote local communities’ understanding of conditions in their landscapes in a way that supports them in initiating and implementing activities that benefit sustainable use and resource management.

It is within this context that the “Indicators of Resilience in Socio-ecological Production Landscapes and Seascapes (SEPLS)” were developed through a project under the Satoyama Initiative, which aims to promote activities for conserving and restoring SEPLS with the vision of “realising society in harmony with nature”. A first set of indicators was developed by Bioversity International and the United Nations University Institute for the Advanced Study of Sustainability (UNU-IAS) and applied in many places around the world (Bergamini et al 2013). Based on this experience, the indicators were further refined and updated in 2014 with additional collaboration by the United Nations Development Programme (UNDP) and the Institute for Global Environmental Strategies (IGES) to make them applicable in an even wider context. The following is largely based on descriptions in the “Toolkit for the Indicators of Resilience in Socio-ecological Production Landscapes and Seascapes (SEPLS)” (UNU-IAS, Bioversity International, UNDP, IGES, 2014) developed by the four organizations, and discussions the authors engaged in during the process of the Toolkit’s development.

Indicators to measure resilience for local communities

The primary purpose of the Indicators of Resilience in SEPLS is to provide local communities with a framework for discussion and analysis of socio-ecological processes essential for SEPLS resilience with the intention of encouraging them to take action. In this sense, it is different from many other indicator frameworks that focus on specific understanding of the landscape and often employ a quantitative approach. The emphasis of the Indicators of Resilience in SEPLS is rather on serving as an opportunity for local communities to collectively deepen their understanding on resilience in their SEPLS and to discuss practical ways to improve it. In a more concrete manner, four areas are identified in which the indicators can contribute to local communities and other stakeholders:

- Understanding SEPLS resilience
- Supporting development and implementation of resilience-strengthening strategies
- Enhancing communication among stakeholders
- Empowering communities in decision-making processes and adaptive management

Aiming to grasp resilience in a more holistic way in different cultural and ecological settings, an approach was taken to monitor elements that can contribute to strengthening resilience or that are present in resilient landscapes. The Indicators of Resilience in SEPLS consist of twenty indicators categorized in five groups: landscape/seascape diversity and ecosystem protection; biodiversity (including agricultural biodiversity); knowledge and innovation; governance and social equity; and livelihoods and well-being.

As mentioned above, SEPLS benefit when they are heterogeneous landscapes and seascapes consisting of different ecosystems, rather than uniform landscapes based on intensively-managed monocultures, and this contributes to resilience by supporting higher biodiversity and ecosystem services. Being the major interface between humans and nature, production activities are key factors in resilience in SEPLS, and supporting biodiversity in relation to production activities is therefore vital. It is important to note that not only ecological but also social and cultural aspects are essential for resilient SEPLS. How communities deal with local ecosystems is closely linked with sociocultural factors such as knowledge, governance and livelihoods. Transmission of traditional knowledge and learning from new practices are both helpful for adaptive management. Governance and social equity play vital roles as they directly and indirectly affect management of natural resources by, for example, restricting or allowing access to land, or by limiting or expanding the ability of local communities and minority groups to carry out sustainable management practices. Finally, resilience in

SEPLS is also dependent on social infrastructure and livelihoods. Table 1 shows how the indicators relate to each of the aspects mentioned here.

The indicators are intended to be used in resilience-assessment workshops participated in by community members and other stakeholders. Their assessment involves assigning scores and trends in response to a question provided for each indicator. Scores are typically given on a 5-point scale, and information about trends can be captured as an upward trend, no change, or a downward trend. Assessment is based on the local communities' own observations and perceptions, so it is the local community's decision how they interpret each indicator and decide scores for the current conditions and trends.

It should be noted again that the indicators differ from other major indicator frameworks that have clear criteria for objective measurement. Since the Indicators of Resilience in SEPLS use a perception-based approach, it is basically not possible to provide numerical data for comparison. Rather, they were developed to serve as a driver for action, with the discussion among participants on the results of their scoring being as important as the scoring results themselves. Through workshop discussions, it is hoped that a community will gain common understanding on issues and areas for improvement, improved communication within and beyond the community, and motivation to take action and link with decision makers and other stakeholders that influence their landscapes.

The set of indicators has been tested in the field by Bioversity International in Bolivia, Burkina Faso, Cuba, Ethiopia, Fiji, Kenya, Mongolia, Nepal, Uganda and others. It has also been used in selected areas in twenty countries participating in the UNDP-implemented Community Development and Knowledge Management for the Satoyama Initiative (COMDEKS) Programme as part of a baseline-assessment and community-consultation process to help measure and understand the resilience of target landscapes and seascapes (UNDP 2014). This has involved assessments conducted through a participatory and inclusive multi-stakeholder process in communities that inhabit, use and protect landscapes and seascapes. These assessments have been subsequently compiled and analyzed to support the development of strategies by identifying appropriate community-based activities in each landscape or seascape to strengthen their resilience.

From these experiences, it seems that the indicators are serving in many landscapes and seascapes as a useful tool to understand the local situation and catalyze efforts, in particular playing specific roles in community-development projects. In future work, more results from their practical application need to be compiled in order to understand effective use of the indicators for the basic purpose of encouraging implementation, trade-offs between measurement of perception-based versus objective and quantitative characteristics, their applicability in wider contexts including in developed countries, and effective ways to link their application to policy processes.

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Table 1. List of indicators and questions for scoring (Source: UNU-IAS, Bioversity International, UNDP, IGES, 2014)

| Indicator description | Questions for scoring |
|-------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Landscape/seascape diversity and ecosystem protection | |
| (1) Landscape/seascape diversity | Is the landscape/ seascape composed of diverse natural ecosystems (terrestrial and aquatic) and land uses? |
| (2) Ecosystem protection | Are there areas in the landscape or seascape where ecosystems are protected under formal or informal forms of protection? |
| (3) Ecological interactions between different components of the landscape/seascape | Are ecological interactions between different components of the landscape or seascape considered while managing natural resources? |
| (4) Recovery and regeneration of the landscape/seascape | Does the landscape or seascape have the ability to recover and regenerate after extreme environmental shocks? |
| Biodiversity (including agricultural biodiversity) | |
| (5) Diversity of local food system | Does the community consume a diversity of locally-produced food? |
| (6) Maintenance and use of local crop varieties and animal breeds | Are different local crops, varieties and animal breeds conserved and used in the community? |
| (7) Sustainable management of common resources | Are common resources managed sustainably? |
| Knowledge and innovation | |
| (8) Innovation in agriculture and conservation practices | Does the community develop, improve and adopt new agricultural, fisheries, forestry, and conservation practices and/or revitalize traditional ones to adapt to changing conditions, including climate change? |
| (9) Traditional knowledge related to biodiversity | Are local knowledge and cultural traditions related to biodiversity transmitted from elders and parents to young people in the community? |
| (10) Documentation of biodiversity-associated knowledge | Is agricultural biodiversity, and associated knowledge documented and |

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|-------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------|
| (11) Women's knowledge | Are women's knowledge, experiences and skills recognized and respected at household, community and landscape levels? |
| Governance and social equity | |
| (12) Rights in relation to land/water and other natural resource management | Does the community have customary and/or formally recognized rights over land, (seasonal) pastures, water and natural resources? |
| (13) community-based landscape/seascape governance | Is there a multistakeholder landscape/seascape platform or institution able to effectively plan and manage landscape resources? |
| (14) Social capital in the form of cooperation across the landscape/seascape | Is there connection, coordination and cooperation within and between communities for the management of natural resources? |
| (15) Social equity (including gender equity) | Is access to opportunities and resources fair and equitable for all community members, including women, at household, community and landscape level? |
| Livelihoods and well-being | |
| (16) Socio-economic infrastructure | Is the socio- economic infrastructure adequate for the needs of the community? |
| (17) Human health and environmental conditions | What is the general health situation of local people also considering the prevailing environmental conditions? |
| (18) Income diversity | Are households in the community involved in a variety of sustainable, income-generating activities? |
| (19) Biodiversity-based livelihoods | Does the community develop innovative use of the local biodiversity for its livelihoods? |
| (20) Socio-ecological mobility | Are households and communities able to move around between different production activities and locations as necessary? |