

Indicators of Resilience in Socio-ecological Production Landscapes and Seascapes



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‘Socio-ecological production landscapes and seascapes’

or SEPLS are dynamic mosaic landscapes and seascapes with habitats and land uses including villages, farmland and adjacent woods, forests, grasslands, wetlands and coastal areas. These landscapes are shaped by the interactions between people and nature in ways that maintain biodiversity and provide humans with goods and services needed for their well-being. A number of studies indicate that the management of these landscapes is compatible with the Ecosystem Approach and the Addis Ababa Principles and Guidelines on the Sustainable Use of Biological Diversity. The Satoyama Initiative, which aims to maintain and, where necessary, revitalize or rebuild SEPLS has been recognized by every meeting of the Conference of the Parties to the Convention on Biological Diversity for its role in better understanding and supporting these landscapes for the benefit of biodiversity and human well-being.¹

Why a resilience approach? In order to maintain, revitalize and rebuild SEPLS in times of global change, a resilience perspective on landscapes and seascapes is essential. In SEPLS, communities create resilience with practices that further their well-being, and also support key ecosystem functions and biodiversity. In order to support these processes, a set of indicators² has been developed and implemented to provide a tool for communities to understand their resilience and encourage the practices that strengthen

it. These indicators help measure a community’s capacity to build resilience and harness ecosystem services through innovation, adaptation, and through local institutions that regulate the sustainable use of biodiversity.

The initial development of the indicators was completed in 2011 by the United Nations University Institute for the Advanced Study of Sustainability (UNU-IAS) and Bioversity International. The indicators were then field-tested through application in SEPLS in more than 20 countries globally and updated to their current version in 2014 by UNU-IAS, Bioversity International, UNDP and the Institute for Global Environmental Strategies (IGES) as part of a collaborative activity under the International Partnership for the Satoyama Initiative (IPSI).

Who will use the indicators and for what?

The indicators are not conceived as a defined set of measurements but rather as a guide to understanding and strengthening resilience. They describe communities’ strategies to cope with and adapt to change through local innovation and the sustainable use of biodiversity. The indicators cover key features of SEPLS that contribute to resilience and complement other existing indicator frameworks focused on community well-being, traditional knowledge and landscape productivity^{3,4,5}.

The main purpose of the indicators is to assist communities in developing resilience-strengthening strategies that encourage innovation, ecosystem protection and beneficial interactions between different landscape components. Unlike many assessment tools, they are defined and measured in terms easily perceived and used by local communities. Areas in which the indicators can prove useful to collaborative initiatives between communities, scientists, conservation and development agencies and other stakeholders are:

- Understanding SEPLS resilience. The indicators provide an analytical framework for understanding resilience and its status and changes in SEPLS.
- Supporting development and implementation of resilience strengthening strategies. Through review and discussion of assessment results, communities can learn what areas and factors to focus on and reflect on strategies to strengthen resilience.
- Enhancing communication among stakeholders. The indicators provide a framework with a common set of parameters to enhance the exchange of experiences and information within and beyond SEPLS and their communities.
- Empowering communities in decision-making processes and adaptive management. Use of the indicators facilitates a continuous process of discussion and participation, leading to active community participation in decision-making.



What do the indicators measure? The indicators measure elements of SEPLS resilience that are, almost by definition, strongly interrelated. The practices and institutions that they describe can be grouped into five areas:

- Landscape/seascape diversity and ecosystem protection
- Biodiversity (including agricultural biodiversity)
- Knowledge and innovation
- Governance and social equity
- Livelihoods and well-being

Landscape/seascape diversity and ecosystem protection. Heterogeneous landscapes and seascapes that resemble natural patterns provide greater biodiversity benefits than intensively-managed monocultures or marine environments where natural ecosystems like mangroves, seagrass beds or coral reefs have been heavily transformed by extractive practices. Resulting SEPLS are likely to support higher levels of biodiversity and be more resilient to external shocks than more simplified systems. In the context of climate change, the protection and restoration of watersheds, forests and coastal ecosystems in SEPLS help regulate hydrology and microclimate, thereby providing a buffer against extreme weather events, floods and droughts.

Biodiversity (including agricultural biodiversity). The health of a landscape or seascape and the ecosystems it

supports is reflected in part in the diversity of species living in it and their interactions. It also often forms the physical, cultural and spiritual bases of communities' well-being. Biodiversity contributes to community and landscape/seascape resilience by providing ecosystem services, which are sustained or degraded by the practices and institutions that regulate the use of natural resources. Agricultural biodiversity includes species used for food, fodder, fiber and fuel, as well as the large number of non-harvested species in the wider landscape that benefit communities through the services they provide, such as pollinators, soil biota and regulators of pests and diseases. Agricultural biodiversity provides material for experimentation, innovation and adaptation. The genetic diversity found in local crop varieties and animal breeds, expressed in important traits such as drought, cold and saline tolerance and resistance to pests and diseases, helps them adapt to various soil and climate conditions. Loss in diversity of these traits decreases options for risk management and adaptation.

Knowledge and innovation. Communities strengthen their own resilience by experimenting, innovating and learning within and between different knowledge systems, cultures and age groups. Adaptation strategies may be novel or old, but generally build on bio-cultural or traditional knowledge. This knowledge is specific to the locations and cultures of given socio-ecological interactions. It is embodied in resource-use

Landscape heterogeneity in the Cuchillas del Toa Biosphere Reserve in Cuba

customs, agricultural traditions, local resources, biodiversity and historical events that have shaped their landscapes and seascapes. The maintenance of this knowledge increasingly depends on the ability of elders, parents and younger generations in a community to document and share it.

Governance and social equity. Gender inequalities, social exclusion and marginalization can hinder the ability of women, indigenous groups and others to strengthen resilience. Women, youth and the elderly hold specific

- 1 CBD COP 10 Decision X/32. Sustainable use of biodiversity.
- 2 Based on work by Van Ouedenhoven, F., Mijatovic, D. and Eyzaguirre, P. (2010) *Social-ecological indicators of resilience in agrarian and natural landscapes*, Management of Environmental Quality: An International Journal 22(2), pp.154-173.
- 3 Suneetha M. S. and Balakrishna Pisupati (2009) *Learning from the Practitioners: Benefit Sharing Perspectives from Enterprising Communities*. UNU-IAS and UNEP.
- 4 Tebtebba Foundation (2008) *Indicators relevant for Indigenous Peoples: a Resource Book*. Indigenous Peoples International Centre for Policy Research and Education.
- 5 Buck, L., Shames, S. and Scherr, S. (2007) *Understanding Ecoagriculture: A Framework for Measuring Landscape Performance*. Ecoagriculture Partners.

knowledge and skills related to biodiversity. For indigenous communities, resilience is intrinsically linked with efforts to protect traditional ways of subsistence and cultural heritage. The abilities to access ancestral lands and engage in traditional land use and agricultural practices are important conditions for communities to maintain biodiversity and associated traditional knowledge.

Livelihoods and well-being. The resilience of a production landscape or seascape is also dependent on the availability of efficient and functioning infrastructure such as communication, health and education to meet various community needs and aspirations. Livelihood improvement can be directly linked to the options and opportunities of community members to engage in a variety of sustainable income-generating activities developed through peoples' ingenuity and the biodiversity portfolio they have available.

How are the indicators used? The indicators presented in the table below have been developed to guide the assessment of resilience during workshops participated in by community members and others. Assessment entails assigning a score and trend to each indicator in response to the questions in the table's first column. A score can be assigned to all indicators using the 5-point scale given in the table's second column, and information about trends and scores can be captured using the categories shown here:

TRENDS	SCORES
↑ Upward trend	(5) Very high (4) High
→ No change	(3) Medium (2) Low
↓ Downward trend	(1) Very low

INDICATORS OF RESILIENCE IN SOCIO-ECOLOGICAL PRODUCTION LANDSCAPES AND SEASCAPES

QUESTIONS FOR SCORING	SCORES
LANDSCAPE/SEASCAPE DIVERSITY AND ECOSYSTEM PROTECTION	
<p>(1) Landscape/seascape diversity</p> <p>Is the landscape/seascape composed of diverse natural ecosystems (terrestrial and aquatic) and land uses?</p>	<p>(5) Very high (There is a large number of natural ecosystems and land uses) (4) High (3) Medium (2) Low (1) Very low (There is only one or a very small number of natural ecosystems and land uses)</p>
<p>(2) Ecosystem protection</p> <p>Are there areas in the landscape or seascape where ecosystems are protected under formal or informal forms of protection?</p>	<p>(5) Very high (Key resources are under some form of protection) (4) High (3) Medium (2) Low (1) Very low (There are no areas under protection)</p>
<p>(3) Ecological interactions between different components of the landscape/seascape</p> <p>Are ecological interactions between different components of the landscape or seascape considered while managing natural resources?</p>	<p>(5) Very high (Ecological interactions are considered while managing natural resources) (4) High (3) Medium (2) Low (1) Very low (Ecological interactions are not considered while managing natural resources)</p>
<p>(4) Recovery and regeneration of the landscape/seascape</p> <p>Does the landscape or seascape have the ability to recover and regenerate after extreme environmental shocks?</p>	<p>(5) Very high (Very high ability to recover and regenerate) (4) High (3) Medium (2) Low (1) Very low (Very low ability to recover and regenerate)</p>



Scoring the indicators at a resilience assessment workshop in Ondangwa, Namibia

BIODIVERSITY (INCLUDING AGRICULTURAL BIODIVERSITY)

<p>(5) Diversity of local food system Does the community consume a diversity of locally-produced food?</p>	<p>(5) Very high (Diversity of locally-sourced foods is very high and these foods are widely consumed) (4) High (3) Medium (2) Low (1) Very low (There are very few or no locally-sourced foods)</p>
<p>(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?</p>	<p>(5) Very high (Local crop varieties and animal breeds are widely conserved and used) (4) High (3) Medium (2) Low (1) Very low (There are few or no local crop varieties and animal breeds)</p>
<p>(7) Sustainable management of common resources Are common resources managed sustainably?</p>	<p>(5) Very high (Common resources are managed sustainably) (4) High (3) Medium (2) Low (1) Very low (Common resources are overexploited or depleted)</p>

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?

- (5) Very high (The community is receptive to change and adjusts its practices)
(4) High
(3) Medium
(2) Low
(1) Very low (The community is not receptive to change and makes few innovations)

(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?

- (5) Very high (Local knowledge and cultural traditions are transmitted to young people)
(4) High
(3) Medium
(2) Low
(1) Very low (Local knowledge and cultural traditions are lost)

(10) Documentation of biodiversity-associated knowledge

Is agricultural biodiversity, and associated knowledge, documented and exchanged?

- (5) Very high (Documentation is robust)
(4) High
(3) Medium
(2) Low
(1) Very low (There is little or no documentation in the community)

(11) Women's knowledge

Are women's knowledge, experiences and skills recognized and respected at household, community and landscape levels?

- (5) Very high (Women's knowledge, experiences and skills recognized and respected at all levels)
(4) High
(3) Medium
(2) Low
(1) Very low (Women's knowledge, experiences and skills are not recognized and respected)



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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?

- (5) Very high (Rights are fully recognized and not disputed)
- (4) High
- (3) Medium
- (2) Low
- (1) Very low (Rights are not recognized and heavily disputed)

(13) Community-based landscape/seascape governance

Is there a multistakeholder landscape/seascape platform or institution able to effectively plan and manage landscape resources?

- (5) Very high (Platform or institution is capable of transparent, participatory and effective decision making)
- (4) High
- (3) Medium
- (2) Low
- (1) Very low (There is no multistakeholder platform or institution)

(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?

- (5) Very high (There is a very high level of cooperation and coordination in natural resource management)
- (4) High
- (3) Medium
- (2) Low
- (1) Very low (There is little or no cooperation and coordination in natural resource management)

(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?

- (5) Very high (Access to resources and opportunities is fair and equitable at all levels)
- (4) High
- (3) Medium
- (2) Low
- (1) Very low (Access to resources and opportunities is not fair and equitable)

LIVELIHOOD AND WELL-BEING

<p>(16) Socio-economic infrastructure</p> <p>Is the socio-economic infrastructure adequate for the needs of the community?</p>	<p>(5) Very high (Socio-economic infrastructure meets all community needs)</p> <p>(4) High</p> <p>(3) Medium</p> <p>(2) Low</p> <p>(1) Very low (Socio-economic infrastructure does not meet community needs)</p>
<p>(17) Human health and environmental conditions</p> <p>What is the general health situation of local people also considering the prevailing environmental conditions?</p>	<p>(5) Very high (Health situation and the environmental conditions are good)</p> <p>(4) High</p> <p>(3) Medium</p> <p>(2) Low</p> <p>(1) Very low (The health and the environmental conditions are bad)</p>
<p>(18) Income diversity</p> <p>Are households in the community involved in a variety of sustainable, income generating activities?</p>	<p>(5) Very high (Households are involved in a variety of sustainable, income generating activities)</p> <p>(4) High</p> <p>(3) Medium</p> <p>(2) Low</p> <p>(1) Very low (Households have no alternative economic activities)</p>
<p>(19) Biodiversity-based livelihoods</p> <p>Does the community develop innovative use of the local biodiversity for its livelihoods?</p>	<p>(5) Very high (Livelihoods are being improved by innovative use of local biodiversity)</p> <p>(4) High</p> <p>(3) Medium</p> <p>(2) Low</p> <p>(1) Very low (Livelihood improvements are not related to local biodiversity)</p>
<p>(20) Socio-ecological mobility</p> <p>Are households and communities able to move around between different production activities and locations as necessary?</p>	<p>(5) Very high (There are sufficient opportunities for mobility)</p> <p>(4) High</p> <p>(3) Medium</p> <p>(2) Low</p> <p>(1) Very low (There are no opportunities for mobility)</p>



Landscape map created by community members in Uttarakhand, India

How were the indicators developed?

The indicators contained in this brochure were developed in 2014 as an update of the original set of Indicators of Resilience in SEPLS created by Bioversity International and UNU-IAS in 2011. A Toolkit publication has also been published containing further elaboration, examples and detailed instructions for the use of the indicators, and is available for download at:

<http://satoyama-initiative.org/wp/wp-content/uploads/2014/11/TOOLKIT-X-WEB.pdf>.



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A *satoumi* seascape with oyster production in the Urato Islands, Japan

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