

# Preface

Human activities have severely degraded most natural ecosystems, which are now in a critical condition. Various approaches have been developed to improve social–ecological systems for a better understanding of environmental problems and to explore better ways to increase the sustainability of both ecosystems and human societies. However, a clear perspective of how to address such problems is still lacking.

Part of the difficulty arises because of the diversity and complexity of ecosystems and human societies. Rich global biodiversity is a source of various ecological resources and services to human beings. Most terrestrial ecosystems affected by human activities comprise a mosaic of different land cover types or sub-ecosystems, and neighboring sub-ecosystems interact with one another through the migration of organisms and the flow of water and other materials. For example, recovery of biodiversity in secondary Bornean forests depends on the colonization of organisms from neighboring forests. In Mongolian grasslands, precipitation water is much better retained when there are adjacent forests. Because water availability is the primary determinant of plant growth, deforestation has a significant impact on grassland productivity and, thus, on the animals that depend solely on the vegetation.

In order to address environmental issues, actors in society who are involved in the land cover changes need to be identified. Some actors do not directly interact with the ecosystem but play a role indirectly via other actors. Ecological resources and services are utilized differently depending on the people, societies, and cultures. Even different actors in the same society use the same resources for different purposes, and this may sometimes cause conflicts. Primary forests used for timber production by international enterprises have been used for the collection of non-timber forest products by local people. Development of technologies and social and cultural changes have also altered the relationships between societies and ecosystems. Large-scale deforestation of primary forests in the tropics and transport of huge timbers that became possible about half a century ago make tropical timbers, which were useless for people living far from tropical areas, a highly valuable resource. On the other hand, the disappearance of natural resources in

daily life motivates people living in cities to develop parks and plant trees in their neighborhood, even if it requires money, time, and land, although urban greenery might not have been given attention until recently. Because of diversity and complexity, predicting how effective a countermeasure would be to address an environmental problem or to foresee all possible outcomes before its implementation might not be easy.

The extremely rapid changes in the social and economical properties of social–ecological systems are another important factor. Recent drastic globalization of the economy and social relationships unite subsystems that might have been almost independent previously. Expansion and fusion of social–ecological systems are considered to basically destabilize the system, while the belief that globalization always worsens the situation might not be based on fact. Because of the rapid changes, even if a useful option to address a problem is found, it may be effective only for a limited time. One of the reasons that some researchers focusing on social–ecological systems emphasize adaptability and resilience rather than pursuing direct solutions is the great variability of the system.

Although there is no direct method to achieve high adaptability and resilience, one possible way is to compare and understand different problems associated with different social–ecological systems. The Research Institute for Humanity and Nature hosts international symposiums every year to discuss the relationships of humanity with nature from different points of view. Included in the contents are findings that came out of symposiums held in 2011 and 2012.

The book consists of ten chapters that have been divided into four parts. The first part, consisting of a single chapter (Chapter 1), provides a broad prospective about what social–ecological systems are, with a review of the theoretical frameworks. Although different frameworks have been proposed and used in different backgrounds, an overarching theoretical framework is not yet available. We hope that some of the ideas discussed in this book may contribute to improving the situation.

The other chapters provide information about the specific aspects and problems in different social–ecological systems. The second part includes four chapters which discuss how human activities changed ecosystems from temperate grasslands to tropical areas. Although, in general, human activities are considered to decrease biodiversity, as shown in Chapter 2 regarding the changes in the species diversity of various biological groups, in the case of some ecosystems, maintenance of biodiversity is highly compatible with human activities, such as a grassland system under pastoralism, as shown in Chapters 3 and 4. Chapter 5 provides an example of how people reintroduce some natural resources and biodiversity into a mostly man-made environment.

The third part focuses on the adaptability of societies to unpredictable fluctuation in ecosystems. Although the present social–ecological systems may be more turbulent, information and knowledge regarding changes in the systems have been accumulated and institutions and techniques to cope with the unpredictability have been established (Chapter 6). Sustainable adaptation in the future should be addressed by analyzing current practices of climate change adaptation (Chapter 7).

The last part, with three chapters, is about factors for resilience of society against social and ecological shocks. Resilience is much more than recovery after a shock. It also involves the ability of individuals, communities, and entire regions to self-organize and increase their capacity for learning, experimentation, and adaptation. Chapters 8 and 9 examine factors related to resilience of relatively poor African communities in rural areas, which are very vulnerable to climatic fluctuations. Under similar physical environments, communities can differ in their adaptation strategies for increasing resilience. On the other hand, the last chapter, Chapter 10 introduces a story of recent changes in rural villages in Borneo, where large-scale development of plantations has altered land cover extensively. While some villages suffer from such development through a decrease in the opportunity for forest use, others take advantage of the development. Changes in resource use by local people seem to be flexible and adaptive, but the changes may potentially decrease resilience of the community by reducing the options they have.

The study of social–ecological systems is necessary to maintain our society. It is also a productive new field for discovering relationships between human society and nature. We hope this book will stimulate readers to do further research on this important and interesting research subject.

Otsu, Shiga, Japan  
Nagasaki, Japan

Shoko Sakai  
Chieko Umetsu

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Sakai, S.; Umetsu, C. (Eds.)

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