Chapter 20
Conclusion and Recommendations

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ABSTRACT

This chapter summarizes key findings of all the chapters contained in the book and presents analytical views on how modeling of land use and climate change and the consequent biodiversity change may potentially be used to assess past, current, and future threats to biodiversity and livelihoods of people at local and regional levels. In addition, this chapter identifies some key results, future innovations and research needs, e.g., accurate land use prediction, downscaling world climate data to local condition, and biodiversity/species distribution model. It also includes how to effectively implement the model results for conservation of land and biodiversity such as protected area system plan, optimal land use policy, environmental impact assessment, and strategic environmental assessment.

1. INTRODUCTION

The various chapters in this book describe how modeling of land use and climate change and the consequent biodiversity change may potentially be used to assess past, current and future threats to biodiversity and livelihoods of people at local and regional levels. Some chapters also point at the use of new fields like land use and biodiversity informatics. In addition, embedding the model results into policy support and implementation was discussed. This chapter identifies some key results, future innovations and research needs, as well as effective implementation of the model results.

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2. BIODIVERSITY AND ECOSYSTEM SERVICES

Biodiversity is defined as the variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems (Secretariat of the Convention on Biological Diversity, 2006). Biodiversity is also a valuable resource for humans. These values of biological resources are classified into two broad categories: direct values and indirect values (Mc Neely, 1998), which are similar to the concept of ecosystem services (MA, 2005). Ecosystem services are divided into four broad categories: provisioning, such as the production of food and water; regulating, such as the control of climate and disease; supporting, such as nutrient cycles and crop pollination; and cultural, such as spiritual and recreational benefits. They are considered of importance as the resource-base for many people, especially the rural poor. Protecting ecosystem services from being degraded may help eradicate poverty at local, national and international levels. Sustainable management of agricultural land and forests may be targeted as the protection of these ecosystem services. In Thailand, the National Economic and Social Development Plan (2008-2011) aims to develop the value of biodiversity and local wisdom for improving the livelihoods of local communities and eradicating local poverty (NESDB, 2008). Meanwhile, the Millennium Development Goals (MDGs) were formally established by the United Nations General Assembly. The MDGs targets for 2015 also address issues of poverty eradication and sustainable development using biological resources as resource-base (MA, 2005).

3. LAND USE, CLIMATE AND BIODIVERSITY MODELS

Deforestation causes a number of effects on biological and physical environment, such as habitat loss, habitat fragmentation, species extinction, deterioration of soil properties, drought, flooding, especially if the resulting cleared land is not managed sustainably. Increased fragmentation often results in the subdivision of the natural environment into isolated patches of different sizes and shapes (Turner and Corlett, 1996) and diminish species distribution and gene flow (Raabova et al., 2007), as well as favors species adapted to edge habitats, but prevents species living in core areas (Yahner, 1988). Section 2 of this book provides general information on the consequence of deforestation and climate change on biodiversity, and shows how Geo-informatics tools to monitor and assess biodiversity and land use change.

Besides deforestation, climate change is one of the greatest challenges of the 21st century for biodiversity conservation. Based on the future development scenarios, especially A1F1 (business-as-usual), temperature would increase by some 2.4 to 6.4 degrees Celsius and the sea would rise some 26 to 59 centimeters at the end of the century, potentially flooding large coastal zones and numerous islands, if no adaptation measures are taken (Secretariat of the Convention on Biological Diversity, 2003). Changes in climate have the potential to directly and indirectly affect individuals, populations and species, ecosystems, and the geographic location of ecological systems. Examples of effects include extinction of wildlife populations, change in phenology and hatching, and immigration of species, disrupted plant communities, species and ecosystems are projected to be impacted by extreme climatic events. In Section 3, several examples of projected impacts of climate change on biodiversity are described