

Chapter 1

Linkage between Biodiversity, Land Use Informatics and Climate Change

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ABSTRACT

Biodiversity is the variety and variability among living organisms and ecological complexes in which they occur; and it can be divided into three levels – gene, species and ecosystems. Biodiversity is an essential component of human development and security in terms of providing ecosystem services, but also it is important for its own right to exist in the globe. Failure to conserve and use biological diversity in a sustainable manner would result in degrading environments, new and more rampant illnesses, deepening poverty and a continued pattern of inequitable and untenable growth. This chapter provides a coherent presentation of the essential concepts, key terminology, historical background of biodiversity, and drivers to biodiversity loss, especially land use/land cover and climate change. A number of land use change models and a general circulation model for prediction of future climate change and its effects on individuals, populations, species, and ecosystems are briefly described. The chapter also introduces the structure of the book including summaries of each chapter.

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1. INTRODUCTION

Humans have been using Earth's terrestrial land for various purposes from time immemorial. It has been increasingly recognized that conversion of pristine land into various forms of land uses and especially their misappropriate use affect ecosystems and cause biodiversity loss. Biodiversity is declining at an unprecedented rate and is expected to continue to decline (sCBD, 2010). The concern over rapid biodiversity decline has urged the international community to organize the Earth Summit in Rio de Janeiro in Brazil in 1992. This general concern is not limited to the decline of biodiversity itself but also includes the very notion that biodiversity is a key factor in the provision of a series of ecosystem goods and services on which humanity depends. Especially the rural poor depend largely on ecosystems that provide food, shelter and protection to natural hazards.

One of the outcomes of the 1992 Earth Summit was the adoption of the Convention on Biological Diversity (CBD), which has been ratified by more than 190 countries. The CBD focuses on conservation of biodiversity, sustainable uses and fair and equitable sharing of benefits arising out of the use of biodiversity. It is one of the most important international conventions and is implemented widely across the World.

Failure to conserve and use biological diversity in a sustainable manner would result in degrading environments, new and more rampant illnesses, deepening poverty and a continued pattern of inequitable and untenable growth. Therefore, in 2002 the Parties to the Convention committed themselves to achieve by 2010 a significant reduction of the current rate of biodiversity loss at the global, regional and national level as a contribution to poverty alleviation and to the benefit of all life on Earth. These targets were endorsed during

the World Summit on Sustainable Development in Johannesburg (UN, 2002)

The so-called "Biodiversity 2010 Targets" were developed and indicators, measures and options were identified to guide implementable activities. Targets are increasingly being used in various areas of public policy. Clear, long-term outcome-oriented targets that are adopted by the international community can help shape expectations and create the conditions in which all actors, whether governments, the private sector, or civil society, have the confidence to develop solutions to common problems. By establishing targets and indicators, progress can be assessed and appropriate actions taken. In addition to the 2010 Biodiversity Targets, the Convention has established other targets, such as the Global Strategy for Plant Conservation, and the Programme of Work on Protected Areas.

Concurrently, the Millennium Development Goals (MDGs) were formally established when the United Nations General Assembly adopted the Millennium Declaration in 2002. MDGs address issues of poverty eradication and sustainable development through a set of targets and dates. One of the significant elements of the MDGs is Goal 7 which focuses on addressing challenges to biodiversity from climate change and pollution. Attempts are being made to maintain and enhance resilience to adapt to climate change, and to reduce pollution and its impacts on biodiversity. These measures are to mainstream biodiversity into not only Goal 7, but also across other MDGs, as achieving the targets of the MDGs will directly or indirectly impinge on the status and use of biodiversity (UN, 2005).

In general land use change has been the main driver of terrestrial biodiversity loss during the past century. Climate change will be a major driver in the near future. Other important factors are nutrient loading, overexploitation, fragmentation and the effects of invasive species (Leadley *et al.*, 2010).

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