Chapter 15

Land Degradation and Biodiversity Loss in Southeast Asia

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ABSTRACT

Land degradation and biodiversity loss are important global change issues because of their enormous effect on the functioning of ecosystem. Despite the fact that there have been tremendous concerns on land degradation and biodiversity loss for nearly two decades, there is still the need of having a sound data and information base, specifically in developing countries. The need has been more pronounced in the face of climate change as these three issues are intricately interlinked. Southeast Asia is an important geographic region from all these perspectives, as it has high biodiversity on the verge of rapid loss, continuing rapid land degradation due to desire of higher economic development, and of climate change importance with a large tract of forest areas in the region. This chapter, first of all, examines general status of land degradation and biodiversity in the region and goes on presenting two case studies. The first case study, based on secondary data, presents land degradation assessment in the Lower Mekong Basin demonstrating the use of spatial data and technologies and various land degradation indicators. The second case study specifically documents plant diversity and examines the relationship of plant diversity with biomass and soil erosion by making use of field surveyed primary data. Both studies aim at producing additional information which can help make better landuse allocation and planning for ecosystem maintenance without compromising much on regional or local livelihood through production.

1. LAND DEGRATION

Given the fact that only 11 percent of the global land surface can be considered as prime or Class I land to feed burgeoning global population, the issues of land degradation is of major significance for world food security and the quality of the environment. Hence, land degradation will remain high on the international agenda in the 21st century. Land degradation refers to land, which due to natural processes or human activity is no longer able to sustain properly an economic function and/or the original natural ecological function (GEF, 1999) arising from the causes, like deforestation, inappropriate agricultural practices, overgrazing. Land degradation involves two interlocking and complex systems: the natural ecosystem and the human social system. Land degradation can take various processes and forms, such as soil erosion due to water and wind, physical deterioration (compaction, sealing), chemical deterioration (soil fertility decline, salinization, acidification), vegetation degradation. The term 'desertification' is found widely used to indicate land degradation in arid, semi-arid and dry sub-humid areas resulting from various factors, including climatic variations and human activities. Causes of degradation and desertification are several and complex. These include socioeconomic factor (e.g. land tenure, marketing, institutional support, income and human health), political (e.g. incentives, political stability), landuse patterns and practices. Globalization phenomena is also adding to land degradation.

Land degradation has multiple and complex impacts on ecosystem functions and services of environment through a range of direct and indirect processes. This ultimately impacts peoples' livelihood through reduced ecosystem functions (e.g. reduced productivity, flooding, and sedimentation) and/or through pollution of ecosystem (e.g. pollution of soil and water). There is clear inter-linkage between land degradation, biodiversity and climate change. While linkage between land degradation and climate change can be of significant importance at global level, the linkage between land degradation and biodiversity can be of significance both at global to local level. In Figure 1, land degradation interrupts the regulating and provisioning services of ecosystems, in particular to reduced primary production and nutrient cycling and reduced carbon sequestration into above- and below-ground carbon reserves (MEA, 2005). Similarly, land degradation also affects biodiversity through loss of nutrients and soil moisture. There are also internal feed-back mechanisms that affect the process and state of these important issues of global importance.

Southeast Asia typically includes the following countries, namely Brunei, Cambodia, East Timor, Indonesia, Lao s, Malaysia, Myanmar, Philippines, Singapore, Thailand, and Vietnam. The issue of land degradation is of global importance, as we increasingly face the challenge of food insecurity and declining ecosystem services, particularly in Southeast Asia, which is highly populated and experiencing a rapid pace of both economic development and ecosystem degradation. Increasing yield to supply more food is almost impossible as almost all cultivable lands are under cultivation. Land degradation can further aggravate the situation (FAO, 2002) since the region as a whole may already have passed the safe limits for agricultural expansion (Eswaran *et al.*, 2001).

According to FAO's (2003) TERRSTAT database, in general, all Southeast Asian countries but Laos suffers from land degradation. The proportion, degraded area of the country's total area, ranges from 36% in Myanmar to 100% in Brunei Darussalam (Table 1). Significant proportions of the rest of the areas of the countries are also still affected by some less severe form of degradation. In majority of case, soil erosion due to water is the main cause of degradation, as the region gets relatively higher rainfall. This form of erosion is accelerated by deforestation and inappropriate agricultural management practices. Chemical

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