Chapter 13
Regional Scenarios of Biodiversity State in the Tropical Andes

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ABSTRACT

Biodiversity assessment represents a baseline for developing conservation strategies, but the assessment of future impact of some policies also requires the development of scenarios. These assessments are particularly important and difficult in areas with high biodiversity such as the Tropical Andes. Therefore three countries were analyzed: Colombia, Ecuador and Peru using the framework of GLOBIO3 to assess the remaining biodiversity for 2000 and for two 2030 scenarios: market forces and policy reforms. The purpose was to identify the most vulnerable areas to biodiversity loss, the most important drivers and the implications of such losses for conservation. Detailed information for each country was used to build the drivers of biodiversity loss (land use/land cover, infrastructure, fragmentation and climate change). The authors discuss the use of this methodology for Andean countries, how the results can be useful for policy and decision makers, and provide suggestions to improve GLOBIO3 at national scales.

1. INTRODUCTION

Global environmental change processes due to human intervention are generating observable effects in different regions of the world. Humans have influenced land cover, atmospheric composition and even soil composition. We are just beginning to understand the complex ways in which these changes affect biodiversity, ecosystem services

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and the goods they provide for human survival. Nevertheless, the changes are expected to persist or even expand because of the continuous resource demand to satisfy human necessities. In this context, several scientists have started research processes to understand the potential impacts on the environment and the drivers of these changes. The most important and known group, the Intergovernmental Panel on Climate Change (IPCC), focus on a global scale providing valuable scientific data about the likely consequences of Climate Change (IPCC, 2007). Despite the advances to understand how global policy decisions can impact ecosystems (IPCC, 2007; UNEP, 2007; OECD, 2008), there are still several steps pending.

Most of the drivers of environmental change at global level are similar to those affecting the regional level. Regional scenarios are important to support decisions at more relevant scales for countries and for the territorial planning within countries. These scenarios are progressively more important in a context of increasing connections between local and global communities where global processes influenced local decisions. Fortunately, biodiversity, mainly the services that it provides, is increasingly been recognized as a key factor to secure the survival of human societies, next to having a value by itself. A first problem to deal with scenarios is the definition of biodiversity indexes, as biodiversity is a complex multilevel concept that includes genetic diversity, species, communities and ecosystems (Millennium Ecosystem Assessment, 2005). Moreover, biodiversity needs to be related to the environmental services that ecosystem processes provide. To attain this, not one, but several indexes that can provide information about biodiversity could be needed. Therefore, the Convention on Biological Diversity (CBD) suggested developing a series of indicators to describe biodiversity changes (CBD, 2006).

Due to the previous considerations, we were in this analysis, interested in a biodiversity index that can provide information to national and regional policy makers about the impact of policy decisions on biodiversity. Our interest area was to investigate three Andean countries, Colombia, Ecuador and Peru. The topography and the presence of several atmospheric conditions define a large environmental heterogeneity, which covers the most arid areas and the wettest areas in the world. We used a regional version of the GLOBIO3 framework to answer two questions: (1) What would be the more vulnerable areas in the Tropical Andean countries given projected changes in main drivers of biodiversity loss? (2) What are the most important drivers of biodiversity loss and what will be the implications for conservation? In the process, we evaluated the applicability of the framework to the environmental regional context and with that experience, discussed the applicability of such framework to regional policy context.

2. CURRENT APPROACHES

The current conscience about global environmental change requires tools to evaluate the impact of human activities, and hence, policy decisions on environment. In order to do this, scientists have developed different approaches to assess current biodiversity state. On the one hand, extinction rates give first approximations at the species level (e.g. Thomas et al., 2004). However, these calculations present drawbacks related to overestimation, uncertainty or lack of sensitivity to short-term change (Balmford, Green, & Jenkins, 2003). Other studies have focused on population size and the reduction of these populations (e.g. Houlahan et al., 2000), or the reduction of habitat range for specific taxa (e.g. Ceballos & Ehrlich, 2002). On the other hand, there are number of studies that have approached the problem considering directly the impact of human induced pressures on biodiversity. The habitat index is one of them, that considers the percentage of undisturbed vegetation based on population density and land use (Hannah, Lohse, Hutchinson, Carr,