Chapter

Prologue: Sustainable Development, Economic Growth and the Fate of Tropical Forests

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1. Tropical deforestation and its actors

We are experiencing, especially in the past few years, critical discussions, both in science and in the general public, about the role of tropical forests to support a more sustainable world, and how we can act to protect these ecosystems [1, 2]. There is a significant concern, especially in developing countries, on how to obtain economic growth using the natural resources within the areas covered by pristine forests without compromising future generations to meet their own needs.

The sustainable development is based on the balance or trade-offs between economic, environmental and social sustainability. It seems to be a simple equation; however, it is important to consider that many actors are included in these three pillars, and to find a common point between them is often complicated. So, how to convince a farmer that it is not possible to extend the area used for agriculture because there is a natural preserved area nearby? Or how to convince mining companies that it is not possible to clear-cut the forest for oil/natural gas exploration since the land is located within an indigenous reserve? And how to convince the urban population that is better to preserve the forest standing instead of producing meat or corn for their food needs or oil/natural gas for their transportation? As we can see, this balancing is not easy to achieve, especially when we talk about developing countries and their need to make economic growth at all costs.

Most of the funding to protect the tropical forests against deforestation in developing countries comes from developed countries that need to achieve their own goals on reducing emissions of carbon to the atmosphere, thus mitigating the impacts caused by climate change. This started in the mid-1990s with the Kyoto Protocol and has been ratified more recently, in 2015, with the Paris Agreement. There has been a considerable scepticism, especially in the population of third world countries, about the fact that developed countries feel entitled to the areas covered by tropical forests, especially the Amazon, because they fund programs to protect and study these regions, and they are neither completely wrong nor completely right. There are two things to be highlighted here. The first is that no country should feel entitled to the vast and luxurious Amazon forest just because they send funds for protection and research. The second is that yet the majority of the Amazon forest belongs to Brazil, and for the indigenous people who live there, this ecosystem acts as a large carbon sink and an enormous source of water to the atmosphere and is of fundamental importance to the survival of future generations.

2. An integrative knowledge for an integrative action

Tropical forests influence the terrestrial climate system due to the exchanges of energy, water and carbon between the surface and the atmosphere. In addition to providing water vapour to the environment, influencing the atmospheric general circulation and contributing to regional precipitation, these ecosystems are important in the global carbon cycle [3, 4]. Consequently, deforestation in the tropics can result in changes on the availability of energy at the surface for the evaporative processes and in the amount of carbon released the atmosphere.

Recent research has shown that tropical forests are a system in biophysical transition [5, 6]. In order to understand the effects of this transition on the environment, and vice-versa, it is necessary to focus on the trade-offs between biodiversity loss and ecosystem services. Yet this balancing between economic growth and sustainable development in tropical regions is still far from being solved, there are a few things that we can do to address some of the issues caused by deforestation: the construction of strategies and conservation plans by the public stakeholders using the knowledge obtained by academic research. That is the only way that we can assure that the tropical regions and their forests will help the future generations by mitigating the impacts of climate change.

This section of the book aims to provide the reader with a comprehensive overview of the current state-of-the-art in habitat fragmentation, natural recovery, soil erosion, river discharge, land-atmosphere exchanges, water cycle, carbon balance, and resilience of the forests to extreme events, taking into consideration the drivers of land degradation and deforestation and further transitions under a climate change scenario.

We hope the issues addressed here contribute to a more integrative knowledge of the impacts of deforestation in the environment and help to the understanding both of the public stakeholders and general population that there is just one way to obtain benefits from tropical forests: keep the trees standing.

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