Mangroves of Latin America: The Need for Conservation and Sustainable Utilization *

Luiz Drude de Lacerda 1 Yara Schaeffer-Novelli 2

1 Dept. Geochemistry, Universidade Federal Fluminene, Niteroi, Brazil
2 Oceanographic Institute of the University of Sao Paulo Sao Paulo Brazil

Twenty years after the Stockholm Conference, when the Charter of the Environment was first adopted by the United Nations, a second Conference on the Environment and Development (UNCED.91, will be sponsored by UN in Rio de Janeiro, Brazil. The key topics of the UNCED will be Biodiversity and Sustainable Development. Since Stockholm, the world has witnessed an accelerated destruction of its natural resources, in particular in developing nations, most of them located in tropics. The process has been so destructive that most forest cover in the tropics may disappear, together with its large biological diversity, by the beginning of the next century.

Latin America has been one of the most affected regions by this rush for wealth at the expenses of Nature. The social-economic crisis of the 80’s has driven nearly half of its population (c.a. 200 million people) into complete poverty, creating heavy pressure upon the environment to achieve better living conditions at any cost. In this scenario, tropical ecosystems have been destroyed at unprecedented rates, either for their timber, charcoal, mineral resources, and the land itself. Among these ecosystems, mangrove forests, due to the exponential growth of coastal, urban, and industrial areas, have been most affected by diverse unsustainable uses, to a point that in certain Latin America countries up to 40% of the original mangrove cover have been eliminated.

Mangroves are the dominant vegetation for over 70% of tropical and sub-tropical coastlines of the world. They form complex forests with high wood biomass and structural complexity. Mangroves have developed morphological, physiological and reproductive adaptations which have allowed the colonization of salty, waterlogged and frequently reducing soils, with rapid growth in areas subject to geomorphic changes. These forests present high rates of primary production and are a key step in the transfer of nutrients, in particular of Carbon, from the continents to the sea and may play an important role, either as sources or sinks in the global cycle of such substances.

In Latin America, mangroves occur in all maritime countries except the three Southernmost nations of the continent. Although only scarce information of total mangrove area in Latin America exists, these forests may cover from 40,000 to 60,000 km² in the entire continent, an area equivalent to the mangrove forests of Southeast Asia and nearly twice the areas occupied by mangroves in Africa. The forests are unevenly distributed along the continent’s coastline, with the Atlantic and Caribbean coasts harboring nearly 70% of the total mangrove area in Latin America; The Pacific coast has a more restricted distribution due to climatic constraints generated by peculiar oceanographic conditions along the Peruvian coasts. The upwelling of the cold Humboldt

* Previously published in Mangroves. International Society for Mangroves Ecosystems Newsletter, 5, May 1992 (ISSN 0917-3676). Reproduced with permission of ISME.
Current waters suppress convective activity and results in very arid climates, high soil salinity and nearly no freshwater inputs, restricting the extension of mangrove forests along the Pacific coast of South America to only 3°30' S, at the Tumbes River estuary. In the Atlantic coast mangroves extends Northward up to Bermuda (lat. 32°N) and Southward to Paranagua; in Brazil (28°30' S).

Mangrove forest In Latin America are best developed along equatorial coasts influenced by the intense convective activity within the Intertropical convergence zone, which generates annual rainfall higher than 2,000 mm, and subjected to mesotidal or macrotidal regimes. These conditions era roughly restricted to within 10° of the equator and occur in the Northwestern part of South America from Northern Equator, Pacific coast of Colombia to Panama and South Costa Rica. On the Eastern coast, the optimal conditions occur South of Gulf of Paria (Venezuela) to Sao Luiz, in Brazil. In this dynamic and humid regions, mangrove forests attain their maximum growth. Red mangrove forests 40 to 50 m in height and more than 1.0 m in diameter have been reported in Ecuador and Colombia. At the Southern coast of Costa Rica and several areas of the Panamanian coast, where seasonality is less pronounced and annual rainfall range from 2,100 to 6,400 mm, mangrove trees exceed 35 m in height and a biomass of 280 ton/ha. Well developed black mangrove forests, with trees up to 30 m in height and 0.7 m in diameter, occur on the coasts of Suriname, French Guyana and Northern Brazil, frequently with biomass over 200 ton/ha. Contrary to Southeastern Asia, Latin America mangrove forests are very poor in number of trees species. Although further systematic Investigation is needed due to high population variability among species of a given genus, Latin America mangroves include only 11 species. These are dominated by the genus Rhizophora (4 species) and Avicennia (4 species). Other important genus are Laguncularia, Conocarpus and Pelliciera, all with only one species. However, over 140 species of birds end 220 species of fish and hundreds species of Invertebrates species and a complex flora of mangrove associates, create high biodiversity environments along otherwise low biodiversity mudflats. Many mangrove areas, due lo the accelerated destruction of inland forests in some Latin American countries, have become important sanctuaries and migratory routes of various species, which otherwise would be threatened lo extinction.

Mangrove play an important role in tropical coastal ecology including many goods and services for the human population. These include: coastline protection and stabilization, nursery for a variety of economically Important shellfish, and a source of Important products to coastal human populations in the form of timber, firewood and charcoal, although some of these benefits are presently little understood or unrecognized among many Latin American countries. Examples of the importance of such amenities provided by mangrove are many in Latino America.

Waterways protection using mangroves are common in Ecuador and Colombia. In Brazil, mangroves have recently been included in the management plans of marinas and coastal condominiums. In Panama, up to 60% of total shrimp fisheries is based on 5 species which depend on mangroves for completing their development. Along the Maranhao coast, North Brazil, huge shrimp production Include two species of shrimp which develop inside the local mangroves. Apart from these indirect amenities, mangrove products themselves are particularly important for many coastal populations. Firewood and charcoal seem lo be the major uses of mangroves in Latin America. In countries like Nicaragua, where nearly 80% of households use wood for cooking, mangroves provide a significant percentage of firewood.

In this country annual firewood extraction reaches up to 9,000 m³. In Honduras the use of firewood may range from 80,000 to 120,000 m³, and in El Salvador, with only 350 km² of mangroves, up lo 30,000 m³ of firewood are extracted annually. In Brazil, mangroves are a regular source of firewood for bakeries and potteries, even along the most: developed areas of the Southeastern coast.

Charcoal production lo another major use of mangrove wood, although only a fraction of the total possible yield to collected due to inefficient extraction techniques. In Costa Rica up to 1,300 m³ of mangrove charcoal is produced annually in the Terraba-Sierpe forests and, in Panama this may reach up lo 7,400 m³. Mangrove bark is still an important source of tannins in most Latin America countries. Bark yields range from 1,840 lo 4,490 kg/ha in Costa Rica, while bark production in Panama may reach over 400 ton/yr.

Despite its enormous importance for most coastal tropical countries in Latin America, mangrove ecosystems have been witnessing an accelerated rush for their resources, most of the time without the necessary care to maintain their integrity and threatening their sustainable utilization. Estimates of deforestation in mangrove areas of Latin America are scarce. Central America has annual cover losses estimated for Nicaragua (385 ha); for Guatemala
(560 ha) and for Costa Rica (45 ha), mostly for conversion into rice fields, salt ponds and mariculture. In Ecuador nearly half of its mangrove area (circa 80,000 ha) has been deforessted for various purposes, particularly for shrimp ponds, during the last two decades. In the Ilha Grande Bay, Southeastern Brazil, almost 80% of the 600 ha of mangrove forest in existence in the early 80's has been reclaimed to build condominiums and marinas.

Apart from deforestation itself, degradation of large mangrove areas is taking place in many Latin America countries due to the misuse of coastal resources. Diversion of freshwater for irrigation and land reclamation purposes has been one of the major actions leading to mangrove degradation. Guanabara Bay mangroves, Rio de Janeiro, occurred an area of 50 km$^2$ in the beginning of the century, is presently nearly totally degraded with less than 15 km$^2$ of pristine forests, mostly due to clear cutting of creeks and river banks, oil spills, solid waste dumping and decreased freshwater inputs.

Worldwide, mangrove forests have received special attention by decision makers in Southeast Asia countries, where these forests have traditionally been incorporated in the local economy, and many forms of sustainable uses are presently taking place. However in other parts of the world, particularly in Latin America, sustainable uses of mangrove forests are virtually nonexistent, resulting in deforestation and degradation of mangrove forest, many cases exposing the coastal zone to destructive ocean forces.

Although much damage has been done, extensive areas of pristine forests still exist in many countries of Latin America. These areas should be preserved and managed for sustainable utilization. Others, which have suffered varying degrees of human impact, may be rehabilitated through replanting, for non-destructive aquaculture, shoreline protection and enrichment of coastal waters. Lessons from past positive and negative experiences should be recorded and analyzed. Taking this into consideration, the International Tropical Timber Organization (ITTo) and the International Society for Mangrove Ecosystems (ISME) started an International project on “Conservation and Sustainable Utilization of Mangroves in Latin America and Africa Regions”. Within the framework of this project, workshops on both continents will be organized, starting with a meeting in Rio de Janeiro, prior to the UNCED meeting in May'92. Briefly the objectives of these workshops are the following:

- To review the present status of mangrove forests in Latin America and Africa, including an evaluation of the data available on their total area, distribution, biodiversity, biogeochemistry and anthropogenic interactions.
- To assess mangrove forests utilization and their social economic importance for the region, as well as an overview of the major environmental impacts upon these forests due to anthropogenic activities.
- To identify and propose management strategies and methods, future research needs and policies to be introduced in the region, to provide sustainable utilization and rational management of mangrove forests.

Authors thanks Gilberto Cintrón his participation in this paper