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Amazonia

Resiliency and Dynamism of the Land and Its People

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UNU Studies on Critical Environmental Regions
Edited by Jeanne X. Kasperson, Roger E. Kasperson, and B.L. Turner II

Note from the editors

This book is the third in a series from the United Nations University (UNU) research project, Critical Zones in Global Environmental Change, itself part of the UNU programme on the Human and Policy Dimensions of Global Change. Both endeavours explore the complex linkages between human activities and the environment.

The project views the human causes of and responses to major changes in biogeochemical systems – global environmental change broadly defined – as consequences of cumulative and synergistic actions (or inactions) of individuals, groups, and states, occurring in their local and regional settings. The study examines and compares nine regional cases in which large-scale, human-induced environmental changes portend to threaten the sustainability of an existing system. The aim is to define common lessons about regional trajectories and dynamics of change as well as the types of human actions that breed environmental criticality and endangerment, thereby contributing to global environmental change. The overall results of the comparative analysis are found in *Regions at Risk*, the initial volume in this series.

The subtitle of *Amazonia: Resiliency and Dynamism of the Land and Its People* hints at the main message of the book: environmental degradation and socio-economic obstacles to sustainability notwithstanding, many positive trends bode well for this diverse region. The authors arrive at this message from an in-depth analysis of five main categories of human driving forces – population, new technologies, socio-economic and institutional conditions, beliefs and attitudes, and income and wealth – that interact to alter the physical, social, and cultural environments of Amazonia. Taking a long view both backward and forward, they counter a popular propensity to relegate the whole of Amazonia to history's roll of environmental disasters by documenting the capacity of stressed environments to withstand and even rebound from ecologically damaging trends.

This long-term perspective revealed, well in advance of confirmatory satellite data, that deforestation in Amazonia has been and is likely to be less widespread than conventional wisdom would have it. The authors, while wary of generalizing on trends and opportunities for so vast and heterogeneous a region, recommend development strategies that will increase the productivity of already deforested areas in order to accommodate population growth without endangering the long-term viability of nature–society relationships.

Titles currently available:

- Regions at Risk: Comparisons of Threatened Environments
- In Place of the Forest: Environmental and Socio-economic Transformation in Borneo and the Eastern Malay Peninsula
- Amazonia: Resiliency and Dynamism of the Land and Its People

Preface

Development pressures are triggering rapid ecological, cultural, and economic changes in Amazonia, one of the world's largest remaining forest frontiers. Some of the environmental effects of development schemes and spontaneous settlement have local and potentially regional and global repercussions. The ecological issues surrounding deforestation include soil erosion, adverse changes in soil structure and fertility, shifts in rainfall patterns, and loss of biodiversity, particularly genetic resources. The driving forces behind land-use changes in Amazonia will be identified, the emerging awareness of economic, cultural, and ecological issues surrounding development will be discussed, and societal responses and management of natural resources will be analysed. A major focus of the study will be identifying resource management strategies for agriculture, particularly in agro-forestry systems, silviculture, and pastures. Such an approach should provide information useful for devising development plans for tropical forest ecosystems that are economically viable and environmentally sound.

In the first chapter, "Amazonia under siege," we explore some of the main themes threading through the book, particularly sustainability and one of its major components: resilience. Here we make the point that the ability of human-manipulated systems to rebound after major surprises is critical to the ultimate "success" of any land use. Criticality is defined and sorted into three main categories: *environmental criticality*, *environmental endangerment*, and *environmental impoverishment*. These broad categories represent varying degrees of "seriousness" of human impacts on the environment. These cat-

egories provide a convenient template when assessing the overall environmental condition of Amazonia, as well as when we spotlight micro-regions experiencing particularly rapid transformation.

Various real and imagined challenges to the health of the regional and global ecosystems are reviewed in chapter 2, "Environmental threats." Here we attempt to sort out what we consider to be the more ominous challenges to the integrity of Amazonian ecosystems, such as loss of biodiversity, from potential red herrings, such as the role of deforestation in purported global warming. The driving forces behind land transformation and overall societal responses to environmental change are explored in chapter 3, "Forces of change and societal responses."

Five chapters are dedicated to a more detailed examination of underlying causes of environmental change and human responses: "Forest conservation and management" (chap. 4), "Silviculture and plantation crops" (chap. 5), "Agro-forestry and perennial cropping systems" (chap. 6), "Ranching problems and potential on the uplands" (chap. 7), and "Land-use dynamics on the Amazon flood plain" (chap. 8). For each land use, whether forest extraction or ranching, cultural and socio-economic forces for change are highlighted and attempts at more rational use of resources are investigated. Emphasis is placed on what is actually transpiring on the landscape at the individual farm, ranch, and plantation level, rather than hypothetical models or results of experiment station trials.

In the final chapter, "Trends and opportunities," we return to an analysis of overall indicators of criticality, such as wealth and well-being and vulnerability. As more of the Amazon is transformed from wilderness to cultural landscapes, the risk of "surprises" is greater, and the need for resilience in human-managed systems increases.

Sizeable portions of Amazonia have already been cleared. If transformed areas were better managed, pressure on the remaining wilderness would be alleviated. A major challenge ahead is to boost the productivity of cleared areas so that population growth and more goods can be coaxed from altered areas without damaging the environment and its people.

A balance is needed between conservation for a variety of environmental services and economic development: success hinges on raising the productivity of all land uses. As productivity levels rise, so will the need to increase and sustain support for research on appropriate resource management strategies. Sustainable development in Amazonia will be possible only by applying modern science as well as

tapping indigenous knowledge systems. Although efforts have been made to upgrade the research capacity of local institutions in Amazonia, much remains to be done. Adjustments to policy and fiscal incentives can certainly help improve the outcome of development and conservation projects in the region, but they will be ephemeral unless societies are equipped with the knowledge and skills to respond to challenges.

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Many individuals kindly shared their thoughts and ideas on various aspects of Amazonian development and conservation with the authors during the preparation of this book. In particular, we would like to thank the following: Osmar Aguiar, Anthony Anderson, Emelecípio Botelho de Andrade, Ronaldo Baena, Edson Barcelos, Dale Bandy, Luis Coirolo, Peter Cooper, Erick Fernandes, Abe Goldman, Michael Goulding, Alfredo Homma, Socorro Kato, Dennis Mahar, Milton Motta, Olinto Gomes da Rocha Neto, Tatyana Sá, Jan Salick, Pedro Sanchez, Steve Sanderson, Robert Schneider, Rafael Seles, José Ferreira Teixeira Neto, Filemón Torres, Manoel Tourinho, Ann Thrupp, Steve Vosti, and Jonas Veiga. We do not wish to imply that any of the above individuals endorse our findings or views.

Roger Kasperson and William Turner II helped sharpen our thinking on conceptual and methodological issues related to criticality, the driving forces behind environmental change, and societal responses. We also benefited from interactions with other teams involved in case-studies in the series, particularly the opportunity to compare our findings and analytical approaches. An anonymous reviewer for the United Nations University Press made many useful comments on an earlier version of the book manuscript.

Two organizations provided financial support for the project. National Science Foundation grants in 1990 and 1991 launched the research effort and a grant from the United Nations University in 1992 helped complete the project. Funds from these sources permitted NJHS to travel to Brazil in January 1991 to initiate work on the

project, provided resources for the co-authors to conduct field trips, and contributed to data analysis and writing.

Many institutions provided invaluable assistance and intellectual input. Several centres of the Brazilian Agricultural Research System (EMBRAPA) kindly provided logistical support and opportunities to interact with scientists working in the region, including CPATU in Pará, CPAF in Acre, CPAA in Amazonas, and CPAF in Rondônia. CPATU, in particular, offered vehicles and the valuable time of staff for numerous field trips in various parts of Pará. Discussions with scientists at the Federal University of Pará and the Museu Goeldi, both in Belém, enriched our thinking about environment and development in Amazonia.

Collaborative work with the above institutions as well as with CIAT (Centro Internacional de Agricultura Tropical) and the Latin America-Environment (LATEN) section of the World Bank enabled NJHS to make 10 field trips to the Brazilian Amazon between November 1991 and April 1993. During those trips, the senior author was able to gather field data and other information relevant to the book. The co-authors also made numerous field trips to the Brazilian Amazon in connection with other ongoing projects as well as this book.

The views and conclusions expressed in this book are those of the authors and do not necessarily reflect the opinions or positions of any institution.

Contents

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Amazonia under siege

Considerable attention has focused in recent years on deforestation rates in Amazonia and on other ecological changes in the vast basin. Concern is mounting that deforestation in Amazonia is contributing to global warming, a reduction of the region's rainfall, ozone depletion, and more severe flooding along certain rivers (Denslow 1988; Myers 1984; Reis 1972). As forests are cut down to make way for new farms, ranches, and mining operations, biodiversity is lost and potential new crop plants and drugs may disappear. Also, people whose lives depend on the forest for sources of food and income can be adversely affected by the shrinking of forest habitats.

Heightened concern about resource management and the fate of forests in Amazonia has even stirred talk in some quarters that the region is global patrimony and should be conserved and developed more rationally. In 1988, President Mitterand of France suggested that countries might want to relinquish sovereignty over portions of their territory for the common good of humanity. To tackle the global warming issue, the United Nations Environment Programme (UNEP) helped forge an international climate treaty that calls for restrictions on burning tropical forests; the treaty was signed by many nations following the United Nations Conference on the Environment and Development in Rio de Janeiro in 1992 (Riebsame 1990). The Rainforest Preservation Foundation of Ft. Worth, Texas, has the status of a public utility in Brazil and solicits contributions of US$25 in magazines[1] to buy and preserve slightly under half a hectare of rainforest.

Such discussion by politicians and some environmentalists ignites

long-held fears in Brazil that foreign interests are intent on interfering or even expropriating Amazonia (ESG 1990; Reis 1960; Simons 1989; Sternberg 1987a). The international preoccupation with environmental issues is sometimes interpreted in Brazil as a smokescreen for the North's domination of the South (Benchimol 1992a,b; Mattos 1992). The notion that Amazonia is a major ecological "safety-valve" for the world and therefore should be under some form of control by the global community thus stirs concerns about sovereignty.

Repeated calls for some form of international intervention in Amazonia could create a nationalistic backlash and make governments intransigent about rectifying environmental problems. Although the Japanese government and multilateral development banks have backed away from supporting efforts to build a road from Acre to Pucallpa in the Peruvian Amazon, which would allow goods from the Brazilian Amazon to be exported via Pacific ports, the Brazilian government has vowed to proceed with this road-building plan in the future (Swinbanks and Anderson 1989). The President of Ecuador has flatly declared that external interference in Amazonian affairs will not be permitted.

Nevertheless, mounting pressure to address environmental and social concerns about development in Amazonia appears to be modifying government stances. Brazil has traditionally eschewed any discussion of debt-for-nature swaps in the Amazon because of concerns about foreign meddling with land-use decisions. Yet recent signs indicate that both the federal and state governments in Brazil are now more amenable to such deals.

Pressure for change is also coming from within countries with territories in Amazonia, although often with international connections. Some 2,000 non-governmental organizations (NGOs) have surfaced recently in Brazil, most of them concerned with policy aspects of social and environmental problems (Homma 1992a). Many of these groups readily capture the attention of the media, help mobilize public opinion, and thereby influence the political agenda. International donors, particularly foundations and NGOs based in major cities of North America and Western Europe, funnel increasing amounts of money and advice to the nascent NGOs with interests in Amazonia. The penetration of these NGOs on the political scene has been made possible by the wave of democracy sweeping Latin America.

Often impassioned debate about the future of the Amazon is thus under way in countries with direct stakes in the region, as well as in the industrialized countries. The media and many scientists and poli-

ticians in South America have expressed shock at the pace of destruction in Amazonia. Environmental changes in Amazonia have become the subject of some popular music in Brazil and abroad, such as Milton Nascimento's album *Yauaretê* (*Iauaretê* means jaguar in *lingua geral* and is the name of a small village in north-western Amazonas). The Grateful Dead, apparently revived by the growing international interest in the fate of rain forests, have written songs for a recently released album entitled *Deadicated*. Although the cover of the album features a red rose, rather than a tropical flower such as an orchid or heliconia, a proportion of the proceeds from the sales of *Deadicated* is supposed to help conserve rain forests (Killian 1991). Sting attended an encounter to "save the Amazon and her people" at Altamira, Pará, in February 1989, and has set up a foundation to help preserve tropical forests and defend indigenous peoples; the event was covered in other Latin American countries, such as Costa Rica (Alvarado 1990).

The exuberant flora and fauna of the region are depicted on T-shirts, dresses, swimwear, and even perfume, such as "Amazone" by Hermès. Fruits and nuts, purportedly collected "sustainably" from the Amazon forest, have found their way into exotic fruit juices, tempting ice-creams, environmentally friendly snacks, and politically correct breakfast cereals marketed in North America. The drama of the frontier in Amazonia with its environmental destruction and social tensions has even been captured in fiction (Mason 1991).

Signs are appearing that preoccupation with the fate of Amazonia is spurring action at the policy level. A number of policy changes over the past 15 years, such as withdrawal of fiscal incentives for creating cattle pastures in rain forests, have addressed some of the concerns about the environment in Amazonia. Article 225 of Brazil's new constitution emphasizes the need to live in harmony with the environment and to preserve nature and natural resources for future generations. Although lofty ideals sometimes remain ethereal, national consciousness is emerging in Brazil and neighbouring countries that Amazonia can be fragile and needs to be managed wisely. And Brazilians, Peruvians, Ecuadorians, Colombians, Bolivians, and Venezuelans will ultimately decide the fate of Amazonia.

Major objectives and regional coverage

The overall objective of this study is to analyse the main environmental threats to Amazonian ecosystems, including the societies that