

Introduction¹

Carol J. Pierce Colfer

Every author in this book has a story to tell about the beginning of his or her interest in human health and forests, and about the experiences that have led them to make the analyses they provide here. I begin with a short account of what gave birth to my own interest in this topic.

In September 1979, I made my first trip up a wide, winding, muddy river in East Kalimantan. I was enchanted by the lush greenery along the banks, the monkeys jumping from branch to branch above, and the pure adventure of it. I was headed for the village of Long Segar. Some two days and a night by slow riverboat from the provincial capital, Long Segar was inhabited by about 1000 Uma' Jalan Kenyah Dayaks, who had moved there voluntarily, beginning in 1963, from the very remote Apo Kayan in Central Borneo. They had come seeking better access to consumer goods, education and medical care; they had left their homeland because of religious and land-tenure conflicts (see Colfer and Dudley, 1993; Colfer et al, 1997; Colfer, in press). In 1975, the Javanese-dominated Indonesian government had classified the new village as a 'resettlement' village. The many resettlement programmes were designed to bring 'primitive' (*terasing*) peoples out of the hinterlands, to give them the benefits of 'development' and to 'civilize' them.

The resettlement project changed things for the Dayaks. The government provided materials for housing, contingent on the people changing from their traditional longhouses (rather like modern condominiums or apartment blocks) to individual homes. This was a significant change with implications for community integrity, social capital, communications and even gender equity. The government also gave planting materials, with specific instructions and maps showing where each plant should go. This resulted in dramatic changes in the settlers' home gardens, with implications for diet as well. Governmental efforts to increase people's incomes involved the distribution of 'seed' cattle – beasts with which the people were completely unfamiliar – with the idea that one calf could be kept and the next distributed, until everyone had a cow. The people went some distance to their rice fields, however, leaving their cattle in the village for days at a time. Free-ranging cattle wreaked havoc in the gardens and failed to prosper. The government supplied an extension agent, whose mandate (as in all Indonesian forested areas) was to convert the people from swidden to permanent agriculture, specifically paddy rice (the agricultural form most valued on Java). However, the topography did not allow for natural irrigation, there were no pumps and the soil was acid and infertile.

The surrounding area was granted as a concession to a foreign timber company, which also tried, with little success, to minimize swidden agriculture – even though it was the only viable system for growing subsistence foods in that context – and to control the

people's use of forest products. Besides removing valuable timber and destroying other forest products, the activities of the company increased the sediment load in the river, with adverse effects on water quality and, probably, fish catches. Toxic chemicals used to protect the felled trees from insects and disease leached into the rivers.

The local people's ill-health was obvious even to me, an anthropologist. During my first month there, nine children died of measles; infant deaths were commonplace. Although not competent to make definitive diagnoses and having no laboratory diagnostic tools, I noted the light brown hair, skinny arms and pot-bellies apparent on many of the children, symptoms that my public health training had taught me often indicate nutritional deficiencies and worms. Women complained of aching legs and fatigue, which I suspected indicated calcium deficiencies and anaemia, among other things. Dramatic infections that spread across people's skin were common. The people were surprised at my tears when their children died; death was too common for people to grieve seriously for the fate of other people's children.

Then, after some eight months in Long Segar, I went to Long Ampung, the village from which Long Segar residents had gradually moved, starting in 1962. It was far inland, near the Malaysian border with Sarawak in the Apo Kayan. Long Ampung had a small population: about 500 people (in 1980) had lived there for decades, using the lands around their community in a 10–15-year rotation, which maintained soil fertility and reasonable harvests of rice and other crops. Their longhouses were surrounded by plants with edible fruits, and the forests were full of animals, particularly the valued Borneo pig. The river that flowed through the village was crystal clear. The people appeared much healthier. The children had well-rounded bodies, and people said that few died in childhood (none died during any of my visits there). Health problems existed, but apparently to a lesser degree than in Long Segar.

This experience made me ponder the interactions among people, health and forests. The links between people and forest foods was obvious, as was the role of forest regrowth in returning fertility and organic matter to the soil, enabling it to produce sufficient rice. Some diseases were more common in forests. Local people had forest medicines, the efficacy of which I was unsure. The intricacy with which the forest was interwoven with their cultural system was clear. The meaning in their lives – and thus their mental health – was dependent on the forest in very profound ways.

Some of the authors represented in this book had similar formative experiences. Others have approached human health and forests from ecological perspectives, starting with the plants and their habitats and then tracing the links to human beings. Still others began with an interest in specific diseases but gradually realized how ecology and human characteristics and behaviour interact with diseases. In many of the chapters, co-authors have used their disciplinary differences to bring to light interactions often neglected by single disciplinary analyses. One of the strengths of this book is the diversity of perspectives that it brings to bear on the broad topic of human health and forests.

THE GENESIS OF THIS BOOK

In this book, we examine people, health and forests, and provide some sense of the universe of experience about the connections, both positive and negative. The interaction between

forests and human health seems intuitively to be a reasonable topic to investigate. Yet we have found that the many papers and books written on the subject are widely scattered in a whole host of disciplines, making it difficult for researchers and students alike to get a handle on the issues. This book is designed to highlight the central issues, as well as expose readers to the wealth of literature on the subject.

We initially approached this topic from the forestry angle, where health issues have only recently emerged as worthy of attention. In the mid-1990s, a series of interdisciplinary and international field teams in Austria, Brazil, Cameroon, Côte d'Ivoire, Germany, India, Indonesia, the USA, and later in Australia and South Africa identified human health as a central issue in the sustainable management of forests (summarized in, for example, CIFOR, 1999).

A separate stream of results on the health of people living in forests has come out of the anthropological literature. Anthropologists conducting ethnographic studies around the world often found forest peoples' health conditions to be abysmal (e.g., Harper, 2002); yet they also often found many positive aspects of indigenous forest-based health-care systems, particularly in terms of nutrition, medicinal plants and approaches to caregiving (for example, see Leaman, 1996). Within the discipline of medicine, investigations of people's health in forests tend to focus on a single disease rather than the health of the population at large, and formal medical practitioners are likely to neglect traditional medicine. A further complication, of course, is the common lack of political will in developing countries to address the health needs of ethnic minorities (who often live in forested areas); donors are also guilty of neglecting these people.²

A small team at the Center for International Forestry Research (CIFOR) therefore convened a series of expert meetings and conducted a literature survey on the topic of forests and health (Colfer et al, 2006). The report identified four main topics of relevance: food and nutrition, disease, medicinal plants and forest-based cultures. However, the survey in many ways raised more questions than it answered, and more research is needed to understand the complex links between forests and human health. I argue that the *kind* of research needed is action research that links researchers and study populations in shared efforts to solve forest health problems.

A further impetus for this book was the Millennium Development Goals, which are symbolic statements of global values. Four of the goals focus specifically on health-related topics: Goal 1 (to eradicate extreme poverty and hunger); Goal 4 (to reduce child mortality); Goal 5 (to improve maternal health); and Goal 6 (to combat HIV/AIDS, malaria and other diseases). Goal 7 (to ensure environmental sustainability) provides an additional stimulus for our work; many have argued that improvements in human health (as part of human wellbeing) are a crucial prerequisite for accomplishing this goal.

Two more Millennium Development Goals stress or imply gender equity: Goal 2 (to achieve universal primary education); and Goal 3 (to promote gender equality and empower women). These goals also have fairly direct implications for human health, given the central role women typically play in family health. In most places, it is women who provide families with nutritious meals and maintain standards of hygiene. In forested areas, women often gather non-timber forest products, collect water and engage in forest agriculture. As the primary caregivers when other family members fall ill, forest women

often use medicinal forest products. Finally, women's decisions about family size affect not only their own health and that of their offspring, but also the health of forests as well.

With all this in mind as background, this book offers a collection of essays on topics that we consider central to the study of human health. The book pulls together diverse approaches to this field of study and highlights the critical need for improved interdisciplinary communication among those concerned with forests and human health.

FOUR CRITICAL ISSUES

In thinking about forests and human health, I would like to highlight four observations that I consider important to bear in mind while reading this book. The first is the comparative lack of attention paid in the health field to people living in forests. The rationale for this neglect always boils down to the facts that forests have few people, resources are limited and health planners are seeking 'the biggest bang for the buck'. These are legitimate points. However, this collection shows clearly that there are serious health problems in forests, and that forest diseases, vectors and reservoirs affect populations far beyond the forest edge.

In the aforementioned survey of health and forests, I was struck by the preponderance of health-related studies conducted in and around cities, even in the medical anthropological literature, where I expected to find a wealth of health findings related to forests. The urban orientation of highly trained personnel, such as medical doctors and nurses, anthropologists, foresters and ecologists, is another factor that cannot be disregarded. The lack of power, wealth and prestige accruing to most forest-dwelling groups ensures that they do not have the political clout to make their desires and needs felt. A related contributing factor is the fact that professional prestige rises as one is able to distance oneself from the poor and the uneducated. New recruits in forestry are sent to the field, while successful senior foresters work in urban-based headquarters; young anthropologists go to the field, but older ones are likely to teach or supervise from afar; in some countries young doctors are required to spend a few years in rural areas, but their reluctance is widely recognized, and few remain as their careers progress. The findings from this collection suggest that real thought should be given to this pattern. Senior people should at least periodically spend time in villages (including forest villages), and greater efforts should be made to institutionalize better health care in forested areas.

A second observation is the significance (and neglect) of forest peoples' cultures. Important aspects of these peoples' cultures involve forests, aspects that give meaning to their lives (see collections by Dove, 1988; Hladik et al, 1990; Croll and Parkin, 1992; Redford and Padoch, 1992). Just as 'civilized' Americans and Europeans value their Christmas trees, so the 'uncivilized' forest-dwellers attach potent symbolic meaning to the forests. The difference is that Westerners have the power and media control to make their forest symbols visible; not so most forest-dwellers. Few outsiders know the meaning of the forest to any given forest community; we routinely 'manage' tropical forests knowing virtually nothing of their significance to local people. That needs to change, if

we are collectively to manage forests and improve people's lives and health more effectively. This is most dramatically relevant for mental health, but of course mental health has implications for physical health.

I am not here suggesting some form of 'cultural tailoring', but rather an iterative process that involves ongoing back-and-forth communication between forest peoples and those who would manage their lives (foresters, ecologists, medical practitioners, governments). Such a process would require attitudinal changes among the educated and powerful (e.g., more respect for local communities, openness to their input) and changes in access to information and other opportunities for forest peoples that would make the playing field more level and empower them.

Meanings vary enormously from culture to culture and time to time. The cultures of adjacent groups in Borneo or Cameroon can be nearly as different as either of them is from French or Japanese culture. We cannot in good conscience paint the 'culture of forest peoples' with one broad stroke, any more than we can so paint communities or women. The variations among cultures, and within a given community or a given gender, are enormous, and they are always changing. Policy-makers throw up their hands at the thought of dealing with such dynamism and complexity, but they need not do so. Governments (and other actors affecting human and forest health) must devise more flexible, bottom-up mechanisms that invite local people more effectively into the policy-making process. No one knows better what is important to local people than they do themselves (though there are also obvious benefits from marrying local and outsider knowledge).

The third observation builds on the second. The contributions in this book show clearly the complexity of ecological forest systems, and the matrix or network of connections between them and the complex human systems that have evolved within forest contexts. The interactions – among seasonality, habitats, eating habits and nutrition (Chapter 4); bats, their behaviour, SARS and other diseases (Chapter 8); or malaria, gold mining, forest clearing and near-genocide (Chapter 11), among many others – demonstrate the complexity of the interconnections (see also Patz et al, 2000). Whether we are looking at health and forests from the perspective of an anthropologist, a virologist, a public-health specialist or a forester, the same level of complexity emerges. What this observation implies is the strong need for expanding our repertoire of research approaches. There is no question that conventional science – in which a specific problem is identified, a hypothesis is formed, experiments are planned and conducted, and the hypothesis is accepted or rejected – has contributed enormously to human welfare, and it will continue to do so. However, for the pressing human and environmental problems in forests, we need some new tools. We need to look at those patterns and interconnections, we need to observe processes and structures, we need to include holistic approaches that take into account total systems. Based on such detailed understanding, we can then hone in on specific conventional research topics. To do this effectively, we – the researchers, project implementers, government officials and service providers – need to communicate our findings and problems more effectively across disciplinary and administrative boundaries. We need to learn each other's languages, professional traditions and norms of interaction (all of which differ markedly); we need to publish in and read each other's journals; we need to speak at each other's professional meetings.

I realize that policy is often *not* evidence-based, as implied by the course of action proposed here. Certainly, broader economic and political forces play important roles in determining what actually happens on the ground, and vested interests can thwart any efforts to insert rational or humane decision-making into policy spheres. However, that does not mean that we should not continue to pursue truth and human and environmental wellbeing through better science and other means at our disposal. We are not impotent.

Finally, this collection brings home dramatically the need to expend more effort trying to *anticipate* change (again, holistically). The authors provide many examples of well-meaning efforts to improve health or human wellbeing that have had exactly the opposite effect. This is not a new observation, but as global warming increases the pressures on the Earth (Menne and Ebi, 2006), we need to think more seriously about the implications of these changes and try to anticipate, rather than just react. Several authors have addressed the possible health implications of climate change.

We now have new techniques to help us anticipate. ‘Future scenarios’, used interactively, allow groups to discuss current situations and their hopes and projections for the future (e.g., Butler et al, 2003; Martens et al, 2006). System dynamics modelling, another method for incorporating qualitative variables (e.g., Dangerfield et al, 2001), allows iterative approximation of current situations as well as investigation of possible future implications, given particular changes. We need to take full advantage of any methods that can help us anticipate what the future holds, and then make health and forest plans that address these probable problems.

OVERVIEW OF THE BOOK

We begin with a series of synthetic overviews (Part I) to set the stage and expose some of the central issues and their interconnections. This section also conveys the diversity of terminology and approaches that characterize investigations into health and forests. We have tried to simplify language as much as possible, but different disciplines approach issues differently, and that is patently clear throughout this multidisciplinary collection.

In Chapter 2, Colin Butler, a physician who worked on the Millennium Ecosystem Assessment, observes that relationships between forests, health and other aspects of human wellbeing are complex, interlinked, bidirectional and multiscaled, over both space and time. He builds on my brief introduction by drawing out a correspondingly broad range of issues that pertain to health and forests. He sets the stage for the more detailed investigations of specific topics that follow.

Chapter 3 (by non-timber forest products specialist Anthony Cunningham, ecologist Patricia Shanley and economist Sarah Laird) examines the role of medicinal plants in the health care of people living in and beyond tropical forests around the world. One important contribution of this chapter is its emphasis on the ubiquity and value of medicinal forest plants outside the forest. Another is its analysis of the threats to medicinal plants and to the forests where they grow.

The focus on medicinal plants is followed in Chapter 4 by a focus on foods. Forest ecologist Barbara Vinceti, anthropologist Pablo Eyzaguirre and nutritionist Tim Johns

provide an illustrative survey of the relevance of forest foods in maintaining the nutritional status of people living in and around forests, stressing the importance of biodiversity maintenance for human beings. Besides documenting the nutritional value of many forest foods, the authors emphasize the particular relevance of such foods for vulnerable groups as a recurrent seasonal safety net, and during times of crisis.

Many of the foods discussed in Chapter 4 require cooking to make them palatable, and in most forests of the world, firewood is the fuel. In Chapter 5, Kirk Smith, an environmental scientist and public health specialist, provides a worrying overview of decades of research on the adverse effects of the routine use of firewood for cooking, particularly on women and small children. He provides details of the constituent parts of smoke and the exposure levels of various groups within society. He divides his survey of the epidemiological evidence on the effects of smoke inhalation into 'well accepted', 'highly suggestive' and 'speculative', and discusses the disease implications of each.

Chapter 6, by myself (an anthropologist), Richard Dudley (a biologist and system dynamicist) and Robert Gardner (a demographer), follows up on Smith's concern with women. After a discussion of global population issues and an introduction to causal loop diagramming, we focus on the 'win-win' aspects of attention to population, both for women and for the health of forest peoples and forests. We argue that access to birth control technology can increase women's income-generating potential, access to education, participation in community action and family health, as well as reducing rates of population growth, with often positive effects on both local environments and women's status.

Our emphasis on women's health continues in Chapter 7 (by Pascale Allotey, a public health specialist, and Margaret Gyapong and myself, both anthropologists). This chapter surveys the literature on common diseases found in forested areas, highlighting the differences based on gender. The authors examine eight of the important diseases affecting peoples living in and near forests, concluding that in many cases, critical (and often ignored) differences in exposure to disease, disease presentation, cultural preferences, treatment by medical personnel, effects of the disease on health and other factors have important gender implications.

Chapter 8 (by virologist Jean Paul Gonzalez and Jean-Marc Reynes, phylogenist and taxonomist Meriadeg Ar Gouilh and immunologist Eric Leroy) uses a disease vector, bats, as an entry point. The authors introduce the lives of bats, showing how their forest contexts and behaviour contribute to the spread of a variety of diseases. They then hone in on SARS, Ebola fever and Nipah virus, all scourges that affect forest peoples (among others), providing detailed analyses of the interactions among environment, vector, disease and humans for these three diseases. The complexity of these interactions for even this one vector, bats, is indicative of the scientific challenge before us as we seek to understand the relationships among forests, people and health.

Continuing the emphasis on disease, Chapter 9 (by economist Subhrendu Pattanayak and epidemiologist Junko Yasuoka) uses human ecological insights to examine the multifarious interconnections between disease and the processes of ecosystem change. Their analyses, which focus primarily on malaria, proceed from global through regional (Brazil) to local level (Indonesia), in each case looking at the interactions among variables

and emphasizing the importance of human behaviour in understanding human health and disease.

In Part II, the focus changes from global synthesis to thematic and regional issues pertaining to forests and health. The intention is to dig deeper into a few examples that represent wider problems.

Focusing again on a specific disease, Chapter 10 (by forester Pascal Lopez), looks at the links between HIV/AIDS and forests in southern Africa. Lopez describes the ravages that the disease has wrought on the natural resource management establishment – similar to reports from Madagascar by participants at a 2004 USAID (United States Agency for International Development) workshop in Bangkok on linking health, population and the environment, who considered HIV/AIDS infection rates among natural resource managers a serious constraint to sustainable management – as well as the important roles the forest plays in providing food and income to families impoverished by illness. The author makes a strong plea for greater attention to HIV/AIDS within the forest sector and for greater interaction between forestry and public health establishments in the region.

Chapter 11 (by anthropologist Gale Gómez) is a careful, longitudinal case study of how forest-cover change has affected the Yanomami, a quintessential forest-dwelling group in South America. Gómez documents the intrusion of gold miners, disease, ranchers and others, and the resulting deterioration of health and lifespan among the indigenous peoples. This case, a more dramatic version of the Borneo experience mentioned at the beginning of this book, clarifies the interconnections among health, forests and people's lives in one context.

In Chapter 12, biological anthropologist and physician Alain Froment takes us to Central Africa, where he examines the health of another group of forest-dwelling peoples, the Pygmies. His perspective is evolutionary, evaluating the fit between these forest people's way of life, level of disease and their environment. He provides useful comparisons between the health of the hunter-gatherer Pygmies and that of the more settled swidden agriculturalists to whom the Pygmies are tied economically; and he provides longitudinal data on the changes that have adversely affected the true forest-dwellers. Because of such changes, the traditional foraging way of life can probably no longer be sustained, and indeed, there are now just three families of one such group, the hunter-gatherer Penan of Sarawak, still living their traditional lifestyle in the forest (Brosius, 2006).

Ethno-botanist Edmond Dounias and I continue this thread in Chapter 13, building on Dounias's experience in Central Africa and complementing it with our respective research in Indonesia. We compare cultural aspects of the lives of Indonesian and Central African forest-dwellers, examining particularly the sociocultural dimensions of diet and health. Two boxes are presented, one methodological and one ethnographic, to provide a fuller understanding of the cultural aspects of health and forests, an issue that is difficult to convey succinctly because of the complexity of human systems.

Part III focuses on health-care service in remote, forested areas, using two specific cases from Indonesia to illustrate the difficulties. In Chapter 14, anthropologist Cynthia Fowler provides a global survey of attempts to integrate traditional medicine with national public health initiatives. She begins with the historical background of the effort to develop an

integrative medicine, and proceeds to describe some national public health policies that strive to make this goal a reality. After describing integrative policies and how they have worked, she discusses the barriers to and conducive conditions for such integration, concluding with some thoughts on post-colonialism, globalization and integrative medicine.

Chapter 15, by physician Robbie Ali, provides a case study of an attempt to integrate comprehensive health care and conservation in Borneo, in Indonesia. He begins by discussing the different conceptual approaches to combining health care and conservation. After describing the context, he describes what The Nature Conservancy and its Indonesian partners (Community Outreach Initiatives and the Ministry of Health) have done in East Kalimantan to address the serious health needs of the Punan, the local hunter-gatherers. His analysis includes assessment of the impacts of their work, on both people's health and the environment.

Anthropologist Gerard Persoon, in Chapter 16, provides another case from Indonesia, this time from Siberut (a remote island just west of Padang, West Sumatra). He compares the people's health status in the past and the present, and analyses what has gone wrong in previous attempts to improve people's health there. He then describes a new effort that involves a bottom-up approach, about which he is cautiously hopeful.

The final chapter pulls together seven features and issues that recur throughout this collection: gender, cultural difference, the roles of insects and animals in disease transmission, emerging diseases, medicinal plants, forest foods, and deforestation and land-use change. This chapter concludes with some recommendations for action, focused particularly on suggestions for more action research and improved interdisciplinary collaboration.

In this book, we have tried to capitalize on a diversity of perspectives to provide a well-rounded view of human health and forests. Our contributors are 15 women and 20 men, representing 14 countries (Australia, Canada, Chile, France, Germany, Ghana, India, Italy, Japan, Netherlands, the Philippines, the UK, the USA and Zimbabwe). We collectively have expertise in anthropology (including ecological, physical, biological, cultural, linguistic and medical), botany (including ethno-botany), demography, ecology, economics, environmental sciences, epidemiology, evolutionary biology, fisheries biology, forestry, forest ecology, immunology, medicine, microbiology, non-timber forest products, nutrition, phylogeny and taxonomy, public health, system dynamics and virology.

Our primary goal is to alert researchers, as well as anyone concerned broadly about forest conservation, development or human health, to the overlapping concerns that we share. Our hope is that this book can provide insights that will lead decision-makers to useful, effective entry points for improving both human and environmental wellbeing.

NOTES

- 1 This chapter has benefited from the helpful critiques of Peter Kunstadter, Mike Arnold, Pablo Eyzaguirre and Subhrendu Pattanayak, though they bear no responsibility for remaining errors.
- 2 Thanks to Peter Kunstadter for these observations (January 2007).

REFERENCES

- Brosius, P. (2006) personal communication, 16 November
- Butler, C.D., Chambers, R., Chopra, K., Dasgupta, P., Duraiappah, A., Kumar, P., McMichael, A.J. and Wen-Yuan, N. (2003) 'Ecosystems and human well-being', in *Ecosystems and Human Well-being: A Framework for Assessment*, Island Press, Washington, DC, pp71–84
- CIFOR (1999) *C&I Toolbox*, CIFOR, Bogor, Indonesia
- Colfer, C.J.P. (in press) *Longhouse of the Tarsier: Changing Landscapes, Gender and Well Being in Borneo*, Borneo Research Council, Williamsburg, VA
- Colfer, C.J.P. and Dudley, R.G. (1993) *Shifting Cultivators of Indonesia: Managers or Marauders of the Forest? Rice Production and Forest Use among the Uma' Jalan of East Kalimantan*, Food and Agriculture Organization of the United Nations, Rome
- Colfer, C.J.P., Peluso, N.L. and Chin, S.C. (1997) *Beyond Slash and Burn: Building on Indigenous Management of Borneo's Tropical Rain Forests*, New York Botanical Garden, New York, NY
- Colfer, C.J.P., Sheil, D. and Kishi, M. (2006) 'Forests and human health: Assessing the evidence', CIFOR Occasional Paper 45, CIFOR, Bogor, Indonesia
- Croll, E. and Parkin, D. (eds) (1992) *Bush Base, Forest Farm: Culture, Environment and Development*, Routledge, London
- Dangerfield, B.C., Fang, Y. and Roberts, C.A. (2001) 'Model-based scenarios for the epidemiology of HIV/AIDS: The consequences of highly active antiretroviral therapy', *System Dynamics Review* 17(2): 119–150
- Dove, M. (1988) *The Real and Imagined Role of Culture in Development: Case Studies from Indonesia*, University of Hawaii Press, Honolulu, HI
- Harper, J. (2002) *Endangered Species: Health, Illness and Death among Madagascar's People of the Forest*, Carolina Academic Press, Durham, NC
- Hladik, C.M., Bahuchet, S. and de Garine, I. (eds) (1990) *Food and Nutrition in the African Rain Forest*, UNESCO/MAB, Paris, France
- Leaman, D.J. (1996) *The Medicinal Ethnobotany of the Kenyah of East Kalimantan (Indonesian Borneo)*, Ottawa-Carleton Institute of Biology, University of Ottawa, Ottawa, Canada
- Martens, P., Lorenzoni, I. and Menne, B. (2006) 'Implications of the SRES scenarios for human health in Europe', in B. Menne and K.L. Ebi (eds) *Climate Change and Adaptation Strategies for Human Health*, Steinkopff Verlag Darmstadt, Heidelberg, Germany, pp395–407
- Menne, B. and Ebi, K.L. (eds) (2006) *Climate Change and Adaptation Strategies for Human Health*, Steinkopff Verlag Darmstadt, Heidelberg, Germany
- Patz, J.A., Graczyk, T.K., Geller, N. and Vittor, A.Y. (2000) 'Effects of environmental change on emerging parasitic diseases', *International Journal for Parasitology* 30(12–13): 1395–1405
- Redford, K.H. and Padoch, C. (1992) *Conservation of Neotropical Forests: Working from Traditional Resource Use*, Columbia University Press, New York, NY