
Contents

Foreword	xi
Introduction	xv
Chapter 1. A Brief History on the Links between Health and Biodiversity	1
1.1. Introduction.	1
1.2. Millennium Development Goals for Ecosystem Services	2
1.3. From environmental health to “one health”	8
1.4. Formerly recognized links	12
Chapter 2. Biodiversity, Cultural Diversity and Infectious Diseases.	15
2.1. Introduction.	15
2.2. Distribution of infectious diseases: links to biological diversity and cultural diversity	15
2.3. Origins of parasitic and infectious diseases in non-human primates.	18
2.4. The first epidemiological transition: “Out of Africa” human migration	19
2.5. Genetic diversity and human migration	20
2.6. Animal domestication.	20
2.7. The beginning of globalization	24
2.8. Conclusion	26

Chapter 3. Loss of Biological Diversity and Emergence of Infectious Diseases	29
3.1. Introduction.	29
3.2. Epidemiology of infectious diseases	31
3.3. Reservoirs of zoonotic infectious diseases	37
3.4. Emerging infectious diseases and the biodiversity crisis	40
3.5. Mechanisms of emergence through habitat modification	42
3.6. Mechanisms of emergence through community modification.	44
3.7. Genetic diversity of hosts and transmission of infectious diseases.	45
3.8. Conclusion	46
Chapter 4. Loss of Biodiversity and Emergence of Non-infectious Diseases	49
4.1. Introduction.	49
4.2. Diversity, host parasite co-evolution and the immune system	51
4.3. The hygiene hypothesis and the parasitic diversity crisis	55
4.4. The "farm" hypothesis: biological diversity and allergies	58
4.5. Conclusion: towards an evolving medicine	60
Chapter 5. Anthropogenic Stress	63
5.1. Introduction: a planet dominated by humans and their animals	63
5.2. Impact of urbanization and road network	67
5.3. Physiology of stress and health	69
5.4. Effects of phytosanitation and biocides	73
5.5. Endocrine disruptors	76
5.6. Antibiotics	78
5.7. Conclusion	80
Chapter 6. Biodiversity Response	83
6.1. Introduction: how life has adapted	83
6.2. Anthropization and synanthropy	84
6.3. Resistance to insecticides.	84
6.4. Resistance to genetically modified plants	89

6.5. Resistance to antiparasitic drugs: the example of artemisinin	89
6.6. Resistance to antibiotics	91
6.7. Evolution of virulence	97
6.8. New biotechnologies and evolution of resistance: Wolbachia, CRISPR-Cas 9	98
6.9. Ecological and evolutionary engineering	99
6.9.1. Management of resistance to Bt transgenic plants.	100
6.9.2. Managing antimicrobial resistance.	100
6.9.3. CRISPR-Cas9 technologies.	101
6.10. Conclusion	101
Chapter 7. Animal and Human Pharmacopoeias.	103
7.1. Introduction.	103
7.2. The diversity of plant secondary metabolites	104
7.3. Origin of self-medication in animals and hominids	107
7.4. Ethnobotany and traditional medicine	110
7.5. Bioprospecting, biopiracy and patents	111
7.6. Conservation biology and traditional pharmacopoeia	115
7.7. Loss of biodiversity and knowledge	116
7.8. Conclusion	116
Chapter 8. Well-being	119
8.1. Introduction.	119
8.2. Objectivity and subjectivity of well-being.	119
8.3. Psychology and the natural environment	122
8.4. Evolutionary psychology and well-being	123
8.5. Theories of habitat and visual refuge, topophilia and biophilia	126
8.6. Implications and applications of biophilia.	127
8.7. Traditional knowledge and well-being.	129
8.8. Conclusion	130
Chapter 9. Ecosystem Services for Health and Biodiversity	133
9.1. Introduction.	133
9.2. Environmental impacts and well-being	134
9.3. Health of ecosystems	136
9.4. Ecosystem services	138
9.5. Ecosystem services and health	140
9.6. Ecosystem disservices and health.	141

9.7. Compromise between services, economic development and health	144
9.8. Conclusion	145
Chapter 10. Biodiversity and Health Scenarios.	147
10.1. Introduction	147
10.2. Prospects and global scenarios	149
10.2.1. Demography	150
10.2.2. Agriculture and livestock	153
10.2.3. Climate change	155
10.2.4. Biodiversity	156
10.2.5. Human health	158
10.2.6. Animal health	160
10.3. Worst-case scenarios	160
10.3.1. Thresholds and tipping points, planetary limits	160
10.3.2. Collapse.	162
10.4. Global risks and "preparedness" for the worst	163
10.5. Towards integrated scenarios	164
10.6. Observations and observatories	168
10.7. Experts and representation of knowledge	170
10.8. Conclusion: scenarios for research and governance	171
Chapter 11. Governance of Biodiversity and Health	173
11.1. Introduction	173
11.2. International governance of biodiversity and health	174
11.3. Regional challenges	179
11.4. Implementation at the national level	183
Chapter 12. Ethics, Values and Responsibilities.	189
12.1. Introduction	189
12.2. Pluralism of scientific approaches.	190
12.3. Some definitions	193
12.4. Humanist and human health ethics	196
12.5. Animal and animal health ethics.	197
12.6. Environmental ethics	199
12.7. Applied and global environmental ethics	201
12.8. Ethics of foresight and scenarios	202
12.9. Confronting the ethics network	203

12.10. Necessity of pluralism of ethics	206
12.11. Conclusion.	208
Chapter 13. The Role of Law, Justice and Scientific Knowledge in Health and Biodiversity	209
13.1. Introduction	209
13.2. Complexity, scientific knowledge and informing political decisions	210
13.3. For a law that is in line with reality: difficulty in implementing the principles of transparency, accountability and participation	212
13.4. Scientific knowledge used by citizens for environmental justice	214
13.5. Human rights and the right to science? Environmental and health challenges	216
Conclusion.	219
Bibliography.	223
Index	279