

*Health and Environment in  
Sustainable Development*

*Five Years after the  
Earth Summit*



World Health Organization  
Geneva  
1997

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# Table of Contents

<i>Message from the Director-General</i>	vi
<i>About this book</i>	viii
<i>Abbreviations and acronyms</i>	x
<i>Units of measurement</i>	xiv
<b>Chapter 1: A New Perspective on Health</b>	<b>1</b>
1.1 How are we doing?	1
1.2 Five years since the Earth Summit	4
1.3 Environmental threats to human health	6
1.4 A health-and-environment cause-effect framework	7
1.5 Relevant information for decision-making and action	10
1.6 Finding solutions to environmental health problems	12
1.7 Supportive environments for health	13
1.8 Power and participation for both men and women	13
1.9 Intersectoral actions for a healthy environment	14
1.10 Health for All: the way ahead	16
<b>Chapter 2: Driving Forces Behind Current Health-and-Environment Trends</b>	<b>19</b>
2.1 The driving forces concept	19
2.2 Population dynamics	20
2.2.1 Population growth and its relation to environment	20
2.2.2 Population structure and changing health concerns	21
2.2.3 Population movement: increasing numbers	22
2.3 Urbanization	23
2.3.1 Urban growth: scale and pace	24
2.3.2 Growth of urban slums	24
2.4 Poverty and inequity	25
2.4.1 The poverty-environmental degradation link	26
2.4.2 Displaced and impoverished groups	27
2.4.3 Status of women: poverty, patriarchy and diminishing resources	28
2.5 Science and technology	29
2.5.1 Research for health and environment	29
2.5.2 Appropriate technology	30

2.5.3	Technology transfer, adaptation and redesign	31
2.5.4	Information and communication technology	33
<b>2.6</b>	<b>Consumption and production patterns</b>	<b>34</b>
2.6.1	Changes in diet: environmental implications	34
2.6.2	Consumption of raw materials and persistent chemicals	35
2.6.3	Burning of fossil fuels	36
<b>2.7</b>	<b>Economic development</b>	<b>37</b>
2.7.1	Economic development as a driving force	37
2.7.2	Economic development trends and environmental hazards	39
2.7.3	Trade development	39
2.7.4	Economic resources for health-and-environment protection	41
<b>2.8</b>	<b>The foundations of sustainability</b>	<b>43</b>

### ***Chapter 3: Major Human Activities Affecting Environmental Quality***

		<b>45</b>
<b>3.1</b>	<b>How driving forces create environmental pressures</b>	<b>45</b>
<b>3.2</b>	<b>Household wastes</b>	<b>45</b>
3.2.1	Human excreta: little or no treatment	46
3.2.2	Solid wastes from households: levels increasing	49
<b>3.3</b>	<b>Fresh water</b>	<b>50</b>
3.3.1	Global freshwater resources: limited, uneven and subject to pressure	50
3.3.2	Global freshwater use: demand inequity	51
3.3.3	Freshwater scarcity: of growing proportions	52
3.3.4	Freshwater pollution: a new problem every decade	53
3.3.5	The marine environment: land-based pressures	55
3.3.6	Hydrology and aquatic environments: integrated planning needed	55
<b>3.4</b>	<b>Land use and agricultural development</b>	<b>57</b>
3.4.1	Competition for land	57
3.4.2	Agricultural development and environmental changes	59
3.4.3	Soil degradation: sources and effects	60
<b>3.5</b>	<b>Industrialization: improved prospects and adverse consequences</b>	<b>62</b>
3.5.1	Emissions, waste and natural resource use	63
3.5.2	Industrial accidents and health-and-environment impacts	67
3.5.3	Industrial activity trends	68
3.5.4	Industry and sustainable development: evolving together	68
<b>3.6</b>	<b>Energy</b>	<b>71</b>
3.6.1	Energy dependency	71
3.6.2	Household use of biomass and coal: impairing indoor air quality	72
3.6.3	Pollution from use of fossil fuels in power stations, industry and transport	74
3.6.4	Hydropower: population dislocation and ecological change	76
3.6.5	Nuclear energy: maintained vigilance needed	76
<b>3.7</b>	<b>Considerable threats to environmental quality and health</b>	<b>78</b>

<b>Chapter 4: Poor Environmental Quality, Exposures and Risks</b>	<b>81</b>
<b>4.1 The human dimension to environmental quality</b>	<b>81</b>
<b>4.2 Air pollution</b>	<b>81</b>
4.2.1 Urban ambient air quality: often poor	82
4.2.2 Indoor air pollution: “rule of one thousand”	84
4.2.3 Human exposures to particulate air pollution	84
4.2.4 Health risks of air pollution	86
4.2.5 Environmental tobacco smoke: on the increase	89
4.2.6 Ionizing radiation: natural and human-caused exposure	90
4.2.7 Air quality management: many factors	92
<b>4.3 Household wastes</b>	<b>93</b>
4.3.1 Health risks of inappropriate excreta disposal	93
4.3.2 Health risks of solid waste	94
<b>4.4 Water</b>	<b>96</b>
4.4.1 Water supply access and equity	97
4.4.2 Sustainability of water supply and sanitation services	98
4.4.3 Environmental health risks of water pollution	99
4.4.4 Chemicals in drinking-water	101
4.4.5 Public health risks from recreational use of water	102
4.4.6 Water related vector-borne diseases	103
<b>4.5 Food</b>	<b>104</b>
4.5.1 Biological hazards in food	105
4.5.2 Chemical and radioactive hazards in food	108
<b>4.6 Soil</b>	<b>111</b>
<b>4.7 Housing</b>	<b>113</b>
4.7.1 The importance of housing for health	113
4.7.2 Extent of the problem	114
4.7.3 Crowding	115
4.7.4 Accidents and injuries	115
4.7.5 Building materials and construction-related problems	116
4.7.6 Indoor air pollution	117
4.7.7 Pests	117
<b>4.8 The workplace</b>	<b>117</b>
4.8.1 The workplace environment and economic development	118
4.8.2 Workplace exposures	119
4.8.3 Occupational health impacts	121
<b>4.9 The global environment</b>	<b>121</b>
4.9.1 From local pressures to global impacts	121
4.9.2 Climate change	122
4.9.3 Stratospheric ozone depletion and its health effects	125
4.9.4 Transboundary air pollution and movement of hazardous waste	127
4.9.5 Dealing with global environmental health problems	128
<b>4.10 Combined exposures from a variety of sources</b>	<b>128</b>
4.10.1 The concept of total human exposure	128
4.10.2 The example of lead	129
<b>4.11 Multiple challenges for health protection</b>	<b>130</b>

<b>Chapter 5: Health Conditions in an Environmental Context</b>	<b>133</b>
<b>5.1 Estimating the burden of disease</b>	<b>133</b>
<b>5.2 Acute respiratory infections</b>	<b>136</b>
5.2.1 One of the greatest threats to child health	136
5.2.2 Historical trends and risk factors	137
5.2.3 Current control strategies	138
<b>5.3 Diarrhoeal diseases</b>	<b>138</b>
5.3.1 The devastating results of poor sanitation	138
5.3.2 The example of cholera	139
5.3.3 Impact of interventions	140
<b>5.4 Vaccine-preventable infectious diseases</b>	<b>142</b>
5.4.1 When immunization helps stop environmental transmission	142
5.4.2 Measles	142
5.4.3 Neonatal tetanus	143
5.4.4 Poliomyelitis	144
5.4.5 Other vaccine-preventable diseases	144
<b>5.5 Malaria, other tropical vector-borne diseases, and newly-emerging diseases</b>	<b>145</b>
5.5.1 Debilitating diseases related to climate and ecological conditions	145
5.5.2 Malaria	146
5.5.3 Other vector-borne diseases	147
5.5.4 Emerging infectious diseases: surveillance needed	148
<b>5.6 Injuries and poisonings</b>	<b>149</b>
5.6.1 Major causes of ill health in both children and adults	149
5.6.2 Road-traffic accidents: a major health problem	150
5.6.3 Occupational accidents: considerable under-reporting	151
5.6.4 Poisonings: few reliable data	152
5.6.5 Intentional injuries: violence	153
<b>5.7 Mental health conditions</b>	<b>155</b>
5.7.1 A growing health concern	155
5.7.2 Effects of chemical and physical factors	155
5.7.3 Effects of psychosocial factors	156
<b>5.8 Cardiovascular diseases</b>	<b>157</b>
5.8.1 The most common cause of death	157
5.8.2 Social and lifestyle risk factors	157
5.8.3 Physical environmental risk factors	158
<b>5.9 Cancer</b>	<b>160</b>
5.9.1 Diseases of concern at all levels of development	160
5.9.2 Occupational cancer	162
5.9.3 Infectious agents	163
5.9.4 Air pollution	163
5.9.5 Water pollution and contaminated food	164
5.9.6 Ionizing radiation	165
5.9.7 Non-ionizing radiation	166
5.9.8 Environmental tobacco smoke: acute and chronic effects	167

<b>5.10</b>	<b>Chronic respiratory diseases</b>	<b>168</b>
5.10.1	The impacts of inhaling polluted air	168
5.10.2	Occupational respiratory diseases	169
<b>5.11</b>	<b>Other diseases</b>	<b>170</b>
5.11.1	Allergies	170
5.11.2	Reproductive health problems	171
<b>5.12</b>	<b>Special features of occupational diseases and injuries</b>	<b>172</b>
<b>5.13</b>	<b>Environmental factors and the global burden of disease</b>	<b>172</b>

***Chapter 6: Integrated Policies, Strategies and Actions:  
Progress Since The Earth Summit*** **177**

<b>6.1</b>	<b>The need for an integrated framework</b>	<b>177</b>
6.1.1	Changing perspectives in health	177
6.1.2	New planning frameworks	178
6.1.3	New health information systems	179
<b>6.2</b>	<b>International initiatives</b>	<b>180</b>
6.2.1	Involvement of the UN system: institutional arrangements	180
6.2.2	Selected cooperative initiatives	183
<b>6.3</b>	<b>A stronger health focus in national planning for sustainable development</b>	<b>185</b>
6.3.1	Regional and country initiatives	186
<b>6.4</b>	<b>A stronger health focus in local planning for sustainable development</b>	<b>189</b>
6.4.1	Relevance at local level	189
6.4.2	Focus on urban areas	189
6.4.3	Focus on rural areas	192
6.4.4	Focus on islands	193
<b>6.5</b>	<b>Integrated planning initiatives: successes and achievements</b>	<b>193</b>
<b>6.6</b>	<b>Renewing “Health for All”</b>	<b>194</b>

***Chapter 7: Conclusions*** **197**

***Glossary*** **203**

***References*** **207**

***Index*** **231**

***Annex A*** **241**

***Annex B*** **242**

# *Message from the Director-General*

**T**he Earth Summit in Rio de Janeiro in 1992 stressed that development is about meeting the needs of people, their health, their well-being, their lives and the environment on which they depend. The basic human need for a safe environment — one which provides clean water, and adequate food and shelter, and in which different people can live together in peace — is the same for all of us. Five years have passed since the Earth Summit and numerous initiatives have been launched at local, national and global level to highlight the need for health-and-environment action. So it is timely to start the analysis of how we are doing as a community of peoples in terms of meeting this need, how development can provide resources for health protection, but also how such development can threaten health through degradation of natural resources. This analysis should highlight problems, but also give examples of solutions that will bring us closer to sustainable development. The dreams and aspirations of a healthy future for the next generation can be accomplished only if we use our current knowledge wisely and take action in solidarity.

This book focuses on the health of girls and boys, women and men, many of whom are struggling to survive and live an acceptable life in a hostile environment. Each day the world has to accommodate yet more people. On average three persons are added to the global population each second, which translates into an average of 90 million more people every year. Population growth in itself creates great difficulties in providing the water, food and shelter that are required for health, especially since most population growth takes place in developing countries where resources are already insufficient. Moreover, unsustainable consumption in the most affluent countries means that the world's non-renewable resources are becoming rapidly depleted. Thus the life-supporting global environment is increasingly subject to stresses such as climate change, loss of biodiversity, desertification and deforestation. The call for sustainable development at the Earth Summit drew the world's attention to environmental issues such as these that are of profound importance for the health of this generation and future generations.

It has probably taken you about two minutes to read this section from the beginning. While you were doing so, 260 girls were born and 264 boys, most of them in developing countries. Those fortunate enough to have been born in developed countries can expect to enjoy a healthy childhood and to live for more than 70 years. But many of those born in developing countries will suffer from a variety of childhood diseases and will not live to see even their fifth birthday. Within each country, the poor and underprivileged are also experiencing the worst health conditions. Inequities of this kind must be addressed by communities and governments, both at local and national level.

Health professionals must press for adequate programmes and resources, join forces with their counterparts in the environmental sector, and establish health-and-environment concerns as a prime element in sustainable development pro-



grammes. On a broader basis, wide participation on the part of all sectors in the community must be ensured if solutions and strategies that achieve sustained improvements in health are to be formulated and implemented. Furthermore, to secure the greatest gains, the current and future needs of people, particularly the poor and vulnerable, must be focused upon. By describing environmental health problems around the world, and some potential solutions for them, this book offers ways to protect and maintain health for the benefit of all.

Hiroshi Nakajima, M.D., Ph.D  
Director-General  
World Health Organization

# *About this Book*

**F**ive years have passed since the Earth Summit, the important United Nations Conference on Environment and Development which took place in Rio de Janeiro. A milestone has thus been reached on the path towards sustainable development. However, new directions in development can take years, if not decades, to gain a foothold. We have therefore chosen to analyse trends pertaining to health-and-environment issues from the early 1970s — the era of the first United Nations Conference on the Human Environment, held in Stockholm — up to the present, and to make projections from the present until the year 2020. In so doing we are able to provide a fifty-year perspective on health and environment within the context of social and economic development.

Specifically, this book demonstrates that environmental quality is crucial for human health. It does this in two ways: by describing the adverse health effects of environmental hazards and by showing, conversely, how a sound environment can support or “enable” health. In showing trends over time and presenting projections for the future it underscores newly emerging environmental health problems and indicates the type of local and national monitoring and assessment that would improve environmental health management.

The book’s intended audience consists of decision-makers, community leaders, scientists and professionals in governmental and nongovernmental organizations who are interested in development issues. It is hoped that this book will inspire professionals working in a variety of development sectors — such as agriculture, industry, environment, aid and planning — and health professionals who wish to become more aware of environmental health issues.

The concept of the environmental cause-and-effect framework provides the book’s structure. The first chapter explains the framework and introduces key issues discussed in this book. The basic driving forces behind environmental health problems, such as population growth, economic development and non-sustainable consumption, need to be addressed if we are to secure a healthy environment and sustainable development. Human activities lead to pressures on the environment from sewage, solid waste and pollution, that may eventually affect the quality or state of the environment. If exposed to unhealthy environmental conditions, people may experience health effects.

This framework accords with the way in which environmental health scientists have begun to extend their investigation of the environmental causes of ill health beyond the traditional focus on localized hazards to human health. This is because it is becoming increasingly accepted that many of those local hazards are the “downstream” products of large-scale environmental pollution and degradation that are linked to human-induced stresses driven by population growth, economic development and technological forces. Consequently, it is becoming evident that promotion and protection of human health may be undertaken more cost-effectively by implementing measures that limit “upstream” damage to the environ-

ment, even though such measures may take some time to yield results. Nevertheless, interventions to control individual exposures to the more downstream hazards may still be preferable if adverse health consequences arising from existing environmental degradation are acute. But in many cases, both approaches will be needed.

The chapters in this book reflect this holistic way of thinking by following the steps of the health-and-environment cause-and-effect framework shown schematically in Fig. 1.3 (see page 9). A more detailed account of this rationale can be found in Chapter 1.

This book is a contribution by WHO to the five-year follow-up to the Earth Summit. This anniversary provides an opportunity to assess the impact made by environmental health activities at local, national and global level during this period. The book systematically brings together quantitative data on health-and-environment linkages at the global level, with examples from regions and countries. Health-and-environment linkages were described in the 1972 WHO report, *Health hazards of the human environment*, and in the 1992 WHO report, *Our planet, our health*, but new information and new ways of considering health and environment issues have emerged, and form the basis of this book.

The programmes on Health and Environment at WHO had the main responsibility for the preparation of this book. Many other programmes at WHO headquarters and Regional Offices contributed text and illustrations. The report could not have been completed without the major efforts of a number of WHO staff members and key consultants. Special thanks are due also to the members of the Director-General's Council on the Earth Summit Action Programme for Health and Environment for their input.

# *Abbreviations and Acronyms*

AAMA	American Automobile Manufacturers Association
AIDS	acquired immunodeficiency syndrome
ARI	acute respiratory infections
ATSDR	(US) Agency for Toxic Substances and Disease Registry
BMJ	British medical journal
BSE	bovine spongiform encephalopathy
CDC	Centers for Disease Control and Prevention (USA)
CFC	chlorofluorocarbon
CHD	coronary heart disease
COPD	chronic obstructive pulmonary disease
CSD	(UN) Commission on Sustainable Development
CVD	cardiovascular disease
DAC	Development Assistance Committee
DALY	disability-adjusted life year
DHHS	(US) Department of Health and Human Services
EC	European Commission
ECA	European Collaborative Action
ECETOC	European Chemical Industry Ecology and Toxicology Centre
ECLAC	(UN) Economic Commission for Latin America and the Caribbean
EEA	European Environment Agency
EEC	European Economic Community
EIA	environmental impact assessment
EME	established market economies
ETS	environmental tobacco smoke
EU	European Union
FAO	Food and Agriculture Organization of the United Nations
FSE	former socialist economies of Europe
GATT	General Agreement on Tariffs and Trade
GDP	gross domestic product
GEMS	Global Environment Monitoring System (UNEP/WHO)
GIS	geographic information system
GHG	greenhouse gas
GDP	gross domestic product
GNP	gross national product
HCFC	Hydrofluorocarbon
HDI	human development index
HFC	halogenated fluorocarbon
HICARE	Hiroshima International Council for the Health Care of the Radiation-exposed
HIV	human immunodeficiency virus
IAEA	International Atomic Energy Agency
IARC	International Agency for Research on Cancer

ICC	International Chamber of Commerce
ICLEI	International Council for Local Environmental Initiatives
ICNIRP	International Commission on Non-Ionizing Radiation Protection
ICRP	International Commission on Radiological Protection
IDRC	International Development Research Centre (Canada)
IETC	International Environmental Technology Centre (UNEP)
IFAD	International Fund for Agricultural Development
IFCS	Intergovernmental Forum on Chemical Safety
IIASA	International Institute for Applied Systems Analysis
ILEC	International Lake Environment Committee
ILO	International Labour Organisation
IMO	International Maritime Organization
IMR	infant mortality rate
INCLEN	International Clinical Epidemiology Network
IOMC	Inter-Organization Programme for the Sound Management of Chemicals
IPCC	Intergovernmental Panel on Climate Change
IPCS	International Programme on Chemical Safety (UNEP, ILO and WHO)
IPHECA	International Programme on the Health Effects of the Chernobyl Accident
IQ	intelligence quotient
ISIC	International Standard Industry Classification
ISRIC	International Soil Reference Information Centre
LAC	Latin America and the Caribbean
JAMA	Journal of the American Medical Association
LPG	liquefied petroleum gas
MARC	Monitoring and Assessment Research Centre (UK)
MEA	multilateral environmental agreement
MEC	Middle Eastern Crescent
MVA	manufacturing value added
NCRP	National Council on Radiation Protection and Measurements (USA)
NEAP	national environmental action plan
NEHAP	national environmental health action plan
NGO	nongovernmental organization
NIOSH	National Institute for Occupational Safety and Health (USA)
NRC	National Research Council (USA)
NT	neonatal tetanus
OAI	other Asia and islands
ODA	official development assistance
OECD	Organisation for Economic Co-operation and Development
ORT	oral rehydration therapy
Oxfam	Oxford Committee for Famine Relief
NT	neonatal tetanus
PAHO	Pan American Health Organization
PEEM	Panel of Experts on Environmental Management for Vector Control (WHO/FAO/UNEP/UNCHS)
PIC	prior informed consent
POP	persistent organic pollutant
SCOPE	Scientific Committee on Problems of the Environment
SDI	sustainable development indicator
SIDA	Swedish International Development Cooperation Agency

SSA	sub-Saharan Africa
SSI	small-scale industry
TT	tetanus toxoid
UN	United Nations
UNCED	United Nations Conference on Environment and Development
UNCHS	United Nations Centre for Human Settlements (HABITAT)
UNCTAD	United Nations Conference on Trade and Development
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNFPA	United Nations Population Fund
UNHCR	Office of the United Nations High Commissioner for Refugees
UNICEF	United Nations Children's Fund
UNICRI	United Nations International Crime and Justice Research Institute
UNIDO	United Nations Industrial Development Organization
UNITAR	United Nations Institute for Training and Research
USDA	United States Department of Agriculture
UNSCEAR	United Nations Scientific Committee on the Effects of Atomic Radiation
USEPA	United States Environmental Protection Agency
UVR	ultraviolet radiation
WARDA	West African Rice Development Association
WASH	Water and Sanitation for Health Project (USA)
WBCSD	World Business Council for Sustainable Development
WCED	World Commission on Environment and Development
WHO	World Health Organization
WHR	World Health Report
WMO	World Meteorological Organization
WRI	World Resources Institute
WSSCC	Water Supply and Sanitation Collaborative Council
WTO	World Trade Organization
YLL	years of life lost

## ***Chemical abbreviations***

Cd	cadmium
CFC	chlorofluorocarbon
Cl <sub>2</sub>	chlorine
CH <sub>4</sub>	methane
CO	carbon monoxide
CO <sub>2</sub>	carbon dioxide
CS <sub>2</sub>	carbon disulfide
DDT	dichlorodiphenyltrichloroethane
F	fluorides
F <sub>2</sub>	fluorine
HC	hydrocarbon
HCB	hexachlorobenzene
HCFC	hydrochlorofluorocarbon
HCHO	formaldehyde
HCl	hydrochloric acid
HF	hydrofluoric acid
Hg	mercury
HNO <sub>3</sub>	nitric acid
H <sub>2</sub> S	hydrogen sulfide
MeHg	methyl mercury
Mn	manganese
NH <sub>3</sub>	ammonia
NO <sub>2</sub>	nitrogen dioxide
NO <sub>x</sub>	nitrogen oxides
N <sub>2</sub> O	nitrous oxide
O <sub>3</sub>	ozone
PAH	polynuclear aromatic hydrocarbon
Pb	lead
PCB	polychlorinated biphenyl
PCDD	polychlorinated dibenzo-p-dioxin
PCDF	polychlorinated dibenzo-p-furan
PM <sub>10</sub>	particulate matter with an aerodynamic diameter of less than 10 μm
POP	persistent organic pollutant
Ra	radium
Rn	radon
R-SH	mercaptan
RSP	respirable suspended particulate
SiF <sub>4</sub>	silicon fluoride
SO <sub>2</sub>	sulfur dioxide
SO <sub>3</sub>	sulfur trioxide
SPM	suspended particulate matter
VOC	volatile organic compounds

# *Units of Measurements*

billion	one thousand million
centi (c)	$10^{-2}$
DU	Dobson unit ( $2.69 \times 10^{19}$ molecules/cm <sup>2</sup> )
exa (E)	$10^{18}$
giga (G)	$10^9$
kilo (k)	$10^3$
mega (M)	$10^6$
milli (m)	$10^{-3}$
micro $\mu$	$10^{-6}$
nano (n)	$10^{-9}$
atm-cm	atmospheres/centimetres
Bq	becquerel
g	gram
Gy	gray
ha	hectare
hr	hour
J	joule
l	litre
m	metre
Sv	sievert



Health and Environment in Sustainable Development - Five Years after the Earth Summit (WHO, 1997, 258 pages). (introduction...)  
Message from the Director-General. About this book. Abbreviations and acronyms. Units of measurements.Â Chapter 2: Driving forces behind current health-and-environment trends. Chapter 3: Major human activities affecting environmental quality. Chapter 4: Poor environmental quality, exposures and risks. Chapter 5: Health conditions in an environmental context. Chapter 6: Integrated policies, strategies and actions: progress since the earth summit. Chapter 7: Conclusions. Glossary. References.Â Environmental health contact points in WHO Regional Offices and WHO Environmental Health Regional Technical Centres.