

# Contents

List of illustrations	xii
Preface	xvi
Acknowledgments	xix
<b>1. About this book</b>	<b>1</b>
1.1 Objectives	1
1.2 Target audiences	1
1.3 Organization of the chapters	2
1.4 Scope	2
1.5 Approach	3
1.6 Glossary of terms	4
<b>Part I. General aspects</b>	
<b>2. The nature of emergencies and disasters</b>	<b>9</b>
2.1 Environmental health and disasters	9
2.2 Disasters and emergencies	9
2.2.1 <i>Hazards and extreme events</i>	9
2.2.2 <i>Disasters</i>	10
2.2.3 <i>Conflict</i>	10
2.2.4 <i>The effects of disasters on environmental health facilities and services</i>	11
2.2.5 <i>Emergencies</i>	12
2.3 Vulnerability to disasters and emergencies	13
2.3.1 <i>The concept of vulnerability</i>	13
2.3.2 <i>High susceptibility</i>	13
2.3.3 <i>Low resilience</i>	14
2.3.4 <i>The impact of disasters at national level</i>	14
2.4 Human actions that increase vulnerability to disasters	15
2.4.1 <i>Improper resource management</i>	15
2.4.2 <i>Urbanization and vulnerability to disasters</i>	15
2.4.3 <i>Rural/urban connections</i>	16
2.4.4 <i>Global environmental change</i>	17
2.5 The disaster-management cycle	17

2.5.1	<i>Disaster management—a developmental approach</i>	17
2.5.2	<i>Sustainable livelihoods and disaster management</i>	18
2.5.3	<i>Limitations in complex emergencies</i>	18
2.6	Steps in disaster management	20
2.6.1	<i>Vulnerability assessment</i>	20
2.6.2	<i>Prevention and mitigation</i>	20
2.6.3	<i>Emergency preparedness</i>	20
2.6.4	<i>Planning, policy and capacity building</i>	21
2.6.5	<i>Emergency response</i>	21
2.6.6	<i>Rehabilitation, reconstruction and recovery</i>	22
2.7	Further information	22
<b>3.</b>	<b>Predisaster activities</b>	<b>24</b>
3.1	Introduction	24
3.2	Institutional arrangements	24
3.2.1	<i>Policy development</i>	24
3.2.2	<i>National and subnational disaster organizations</i>	24
3.3	Vulnerability and capacity assessment	25
3.3.1	<i>The purpose and process of vulnerability and capacity assessment</i>	25
3.3.2	<i>Hazard mapping</i>	27
3.3.3	<i>Vulnerability analysis of water-supply systems</i>	28
3.3.4	<i>Assessment of environmental health vulnerability</i>	28
3.3.5	<i>Describing communities, their environment and the effects of hazards</i>	28
3.3.6	<i>Ongoing monitoring of vulnerability</i>	30
3.3.7	<i>Environmental health review of development policies and projects</i>	30
3.4	Prevention and mitigation	30
3.4.1	<i>Reducing community vulnerability through long-term environmental health improvements</i>	30
3.4.2	<i>Environmental safety regulations</i>	31
3.4.3	<i>Reducing the vulnerability of environmental health infrastructure</i>	31
3.4.4	<i>Protecting other facilities</i>	32
3.5	Preparedness and planning	32
3.5.1	<i>The national emergency planning process</i>	32
3.5.2	<i>A general model for disaster-preparedness planning</i>	33
3.5.3	<i>Strategic plans and operational plans</i>	36
3.5.4	<i>Participatory methods in planning</i>	36
3.6	Institutional learning and memory	37
3.6.1	<i>Evaluation of emergencies and disasters</i>	37
3.6.2	<i>Vulnerability analysis of major projects</i>	37
3.6.3	<i>Using rules and regulations concerning environmental health and hazards</i>	38
3.7	Warning indicators	38
3.7.1	<i>Early warnings</i>	38
3.7.2	<i>Slow-onset hazards</i>	38

3.7.3	<i>Hazards with moderate warning time</i>	39
3.7.4	<i>Warning of industrial accidents</i>	40
3.7.5	<i>Warning of refugee movements</i>	40
3.8	Further information	40
<b>4.</b>	<b>Emergency response</b>	<b>42</b>
4.1	Assessments	42
4.1.1	<i>Purpose of emergency assessments</i>	42
4.1.2	<i>Process of assessments</i>	43
4.1.3	<i>Field assessment techniques</i>	43
4.1.4	<i>Organizing an emergency assessment</i>	44
4.2	Evacuation	44
4.2.1	<i>Disaster warnings and emergency instructions</i>	45
4.2.2	<i>Organized evacuation</i>	45
4.2.3	<i>Spontaneous evacuation</i>	45
4.2.4	<i>Environmental health services on evacuation routes</i>	45
4.2.5	<i>Environmental health problems associated with evacuations</i>	46
4.2.6	<i>Influencing settlement in evacuations</i>	46
4.2.7	<i>Strengthening services in host communities</i>	47
4.2.8	<i>Problems with temporary emergency settlements</i>	47
4.3	Environmental health measures in the emergency phase	48
4.3.1	<i>General objective and activities</i>	48
4.3.2	<i>Priorities for emergency response</i>	49
4.3.3	<i>Hospitals and relief centres</i>	49
4.3.4	<i>Environmental health in search and rescue operations</i>	50
4.4	Organization of environmental health activities during emergencies	51
4.4.1	<i>The place of environmental health in the organization of emergency activities</i>	51
4.4.2	<i>Emergency field teams for assessment and initial response</i>	53
4.4.3	<i>Other specialized emergency environmental health functions</i>	53
4.4.4	<i>Coordination of emergency response activities</i>	53
4.5	Personnel management in emergencies	54
4.5.1	<i>Professional functions</i>	54
4.5.2	<i>Flexibility in the use of human resources</i>	55
4.5.3	<i>Cooperation with the private sector</i>	55
4.5.4	<i>Working with volunteers</i>	55
4.5.5	<i>Facilities for emergency personnel</i>	55
4.5.6	<i>Support for specialist activities</i>	56
4.5.7	<i>Subsistence needs of personnel</i>	56
4.5.8	<i>Security and safety needs of personnel</i>	56
4.5.9	<i>Psychological needs of personnel</i>	57
4.5.10	<i>Administrative support for personnel</i>	57
4.6	Equipment and supplies	58
4.6.1	<i>Types of equipment needed</i>	58

4.6.2	<i>Procurement</i>	58
4.6.3	<i>Specifications</i>	59
4.6.4	<i>Storage and distribution</i>	59
4.7	<i>Transportation and logistics</i>	59
4.7.1	<i>Types of vehicle required</i>	60
4.7.2	<i>Sources and numbers of vehicles required</i>	60
4.7.3	<i>Repairs and maintenance</i>	61
4.7.4	<i>Road operations: transportation logistics in field operations</i>	61
4.7.5	<i>Air operations</i>	61
4.7.6	<i>Other modes of transportation</i>	62
4.7.7	<i>Pooling of transportation services</i>	62
4.7.8	<i>Vehicle priorities</i>	62
4.7.9	<i>Field logistics systems</i>	62
4.8	<i>Telecommunications</i>	63
4.8.1	<i>Types of telecommunications equipment</i>	63
4.8.2	<i>Sources of radio communications</i>	64
4.8.3	<i>Developments in telecommunications</i>	64
4.9	<i>Financial procedures</i>	65
4.10	<i>Rules, standards and guidelines in disaster response</i>	65
4.10.1	<i>Importance of rules and guidelines in emergencies</i>	66
4.10.2	<i>Basic principles for creating rules for emergencies</i>	66
4.10.3	<i>Special rules in areas of high potential public-health risk</i>	67
4.10.4	<i>Rules concerning foreign relief workers</i>	67
4.10.5	<i>International standards and codes of conduct for humanitarian response</i>	67
4.11	<i>International assistance</i>	68
4.11.1	<i>In-country coordination</i>	68
4.11.2	<i>Forms and functions of international assistance</i>	69
4.11.3	<i>Integrating international staff and local specialists</i>	69
4.11.4	<i>Guidelines on employment of international assistance teams</i>	69
4.12	<i>Further information</i>	70
<b>5.</b>	<b><i>Recovery and sustainable development</i></b>	<b>71</b>
5.1	<i>From disasters to development</i>	71
5.1.1	<i>The transition from relief to recovery</i>	71
5.1.2	<i>Sustainable development</i>	71
5.1.3	<i>Increasing individual and institutional capacity</i>	72
5.2	<i>Assessment for recovery</i>	72
5.2.1	<i>Reconstruction of housing</i>	73
5.2.2	<i>Reconstruction of water-supply and sanitation systems</i>	75
5.2.3	<i>Secondary damage assessment</i>	75
5.2.4	<i>Secondary vulnerability assessment</i>	76
5.3	<i>Recovery planning</i>	77
5.4	<i>Recovery in different contexts</i>	78
5.4.1	<i>Self-sheltering or short-term evacuees</i>	78
5.4.2	<i>Resettlement</i>	78

5.4.3	<i>Rehabilitation and reconstruction for long-term camp residents</i>	80
5.4.4	<i>Chronic conflict situations</i>	80
5.5	Post-disaster environmental health activities and sustainable development	81
5.5.1	<i>Vulnerability reduction</i>	81
5.5.2	<i>Specific implications of sustainable development in environmental health planning</i>	81
5.6	Further information	82

## **Part II. Technical aspects**

<b>6.</b>	<b>Shelter and emergency settlements</b>	85
6.1	Introduction	85
6.2	Assistance to self-sheltering populations	85
6.3	Short-term shelter in existing buildings	86
6.4	Site selection and arrangement of emergency settlements	87
6.5	Longer-term issues for emergency settlements	89
6.6	Community participation in environmental health management	90
6.7	Further information	91
<b>7.</b>	<b>Water supply</b>	92
7.1	Water-supply preparedness and protection	92
7.1.1	<i>Establishing and protecting small-scale decentralized supplies</i>	92
7.1.2	<i>Establishing and protecting large-scale, centralized supplies</i>	93
7.1.3	<i>Preparation for displacement emergencies</i>	94
7.2	Emergency water-supply strategy	94
7.2.1	<i>Situations demanding an emergency water-supply response</i>	94
7.2.2	<i>Emergency response strategy</i>	95
7.2.3	<i>Rural emergencies</i>	96
7.2.4	<i>Emergency water-supply measures in urban areas</i>	97
7.2.5	<i>Supplies for affected periurban areas</i>	98
7.2.6	<i>Short-term displacement and temporary shelters</i>	99
7.2.7	<i>Long-term emergency settlements</i>	99
7.3	Assessment	99
7.3.1	<i>Assessment of damage and available water resources</i>	100
7.3.2	<i>Needs assessment</i>	100
7.3.3	<i>Needs and standards</i>	101
7.4	Emergency water-supply techniques	103
7.4.1	<i>Water sources</i>	103
7.4.2	<i>Water quality and water testing in emergencies</i>	113
7.4.3	<i>Treatment of emergency water supplies</i>	117
7.4.4	<i>Water movement, storage and distribution</i>	121
7.4.5	<i>Prepackaged water kits</i>	124

7.4.6	<i>Facilities for personal hygiene</i>	124
7.5	Operation and maintenance	126
7.6	Further information	126
<b>8.</b>	<b>Sanitation</b>	<b>127</b>
8.1	Human waste and health	127
8.1.1	<i>Faeces</i>	127
8.1.2	<i>Urine</i>	127
8.1.3	<i>Sullage</i>	127
8.1.4	<i>Solid waste</i>	128
8.1.5	<i>The importance of hygiene behaviour</i>	128
8.2	Strategy for excreta disposal in emergencies	128
8.2.1	<i>Situations demanding an emergency excreta-disposal response</i>	128
8.2.2	<i>Gradual improvement</i>	130
8.2.3	<i>Technology choice</i>	130
8.2.4	<i>Assessment</i>	132
8.2.5	<i>Standards</i>	132
8.3	Techniques for excreta disposal in emergencies	132
8.3.1	<i>Defecation fields</i>	133
8.3.2	<i>Shallow trench latrines</i>	134
8.3.3	<i>Deep trench latrines</i>	134
8.3.4	<i>Simple pit latrines</i>	136
8.3.5	<i>Other types of latrine</i>	136
8.3.6	<i>Site selection for latrines</i>	138
8.3.7	<i>Management of excreta disposal facilities</i>	138
8.4	Disposal of wastewater (sullage)	139
8.4.1	<i>Assessment of the problem and design of the response</i>	139
8.4.2	<i>Wastewater disposal techniques</i>	139
8.5	Management of refuse	142
8.5.1	<i>Assessment of the problem and design of the response</i>	142
8.5.2	<i>Refuse storage</i>	142
8.5.3	<i>Refuse collection and transport</i>	143
8.5.4	<i>Treatment and disposal</i>	143
8.5.5	<i>Disposal of rubble</i>	144
8.5.6	<i>Medical wastes</i>	145
8.6	Further information	147
<b>9.</b>	<b>Food safety</b>	<b>148</b>
9.1	The importance of safe food	148
9.2	Food control	149
9.2.1	<i>Food control measures</i>	149
9.2.2	<i>Salvageable and unsalvageable foods</i>	149
9.2.3	<i>Inspection of food businesses</i>	151
9.2.4	<i>Control of donated or imported food</i>	151
9.3	Food safety and nutrition	151
9.3.1	<i>General considerations</i>	151
9.3.2	<i>Providing dry rations for household cooking</i>	151

9.3.3	<i>Mass-feeding centres</i>	153
9.3.4	<i>Therapeutic-feeding centres</i>	154
9.3.5	Breastfeeding and breast-milk substitutes	154
9.4	Public education and information	156
9.5	Safe and hygienic warehouse management	157
9.6	Further information	157
<b>10.</b>	<b>Vector and pest control</b>	<b>158</b>
10.1	The importance of vector and pest control in disasters and emergencies	158
10.1.1	<i>Assessment</i>	159
10.2	Disease control and nuisance control	159
10.2.1	<i>Disease control</i>	159
10.2.2	<i>Nuisance control</i>	159
10.3	Available control measures	160
10.3.1	<i>Density reduction</i>	160
10.3.2	<i>Longevity reduction with pesticides</i>	160
10.4	Environmental management for vector and pest control	163
10.4.1	<i>The benefits of environmental management</i>	163
10.4.2	<i>Environmental management measures for vector and pest control</i>	163
10.5	Hygiene and personal protection	164
10.5.1	<i>The importance of hygiene and personal protection</i>	164
10.5.2	<i>Repellents</i>	164
10.5.3	<i>Impregnated materials for malaria control</i>	166
10.5.4	<i>Disinfection and disinfestation</i>	166
10.6	Further information	166
<b>11.</b>	<b>Control of communicable diseases and prevention of epidemics</b>	<b>168</b>
11.1	The importance of communicable diseases in emergencies and disasters	168
11.2	Measures for controlling communicable diseases and epidemics	169
11.2.1	<i>Preparedness and prevention</i>	169
11.2.2	<i>Public-health surveillance</i>	171
11.2.3	<i>Outbreak control</i>	172
11.3	The control of cholera: an example	173
11.4	Further information	174
<b>12.</b>	<b>Chemical incidents</b>	<b>175</b>
12.1	Types of chemical incident	175
12.2	The health effects of chemical incidents	175
12.2.1	<i>Toxic effects of chemicals</i>	175
12.2.2	<i>Public-health effects of chemicals</i>	175
12.3	Operational planning and preparedness	176
12.3.1	<i>Multidisciplinary public-health working arrangements</i>	177
12.3.2	<i>Vulnerability assessment</i>	177
12.3.3	<i>Local incident surveillance and environmental monitoring</i>	178

12.3.4	<i>Baseline health assessment</i>	178
12.3.5	<i>Health impact assessment</i>	179
12.3.6	<i>Baseline environmental assessment</i>	179
12.3.7	<i>Liaison with the local community</i>	179
12.3.8	<i>Public-health plans for chemical incidents</i>	180
12.3.9	<i>Databases</i>	180
12.3.10	<i>Reducing the probability of incidents</i>	181
12.3.11	<i>Reducing the health risks of incidents</i>	181
12.3.12	<i>Establishing routine procedures</i>	181
12.3.13	<i>Conducting exercises and training</i>	183
12.3.14	<i>Conducting national chemical incident surveillance and contributing to international chemical incident surveillance</i>	185
12.4	<i>Dealing with chemical incidents</i>	185
12.4.1	<i>Alerting the health-care services</i>	185
12.4.2	<i>Best outcome assessment/estimation</i>	185
12.4.3	<i>Information and public warnings—communication skills</i>	186
12.4.4	<i>Advice on protection</i>	186
12.4.5	<i>Sheltering or evacuation/removal</i>	186
12.4.6	<i>Other restrictions to protect health</i>	186
12.4.7	<i>Organizing registers and samples</i>	187
12.4.8	<i>Collection of samples—biomarkers of chemicals and their effects</i>	187
12.4.9	<i>Environmental monitoring</i>	188
12.5	<i>Assessing the impact on public health</i>	188
12.5.1	<i>Health impact assessment</i>	189
12.6	<i>Further information</i>	190
<b>13.</b>	<b>Radiation emergencies</b>	191
13.1	<i>Health consequences of radiation</i>	191
13.2	<i>Radiation from nuclear incidents</i>	191
13.3	<i>International and local response to a major nuclear accident in compliance with the Convention on Early Notification and Assistance Convention</i>	191
13.4	<i>The role of WHO in a radiation emergency</i>	193
13.5	<i>Mitigation of effects</i>	193
13.6	<i>Inadvertent exposure to radioactive material</i>	196
13.7	<i>Further information</i>	197
<b>14.</b>	<b>Mortuary service and handling of the dead</b>	198
14.1	<i>Recovery of the dead</i>	198
14.2	<i>Organization of the mortuary</i>	198
14.3	<i>Identification of the dead</i>	199
14.4	<i>Handling the dead</i>	199
14.5	<i>Ceremonial aspects</i>	200
14.6	<i>Further information</i>	201

<b>15. Health promotion and community participation</b>	202
15.1 Definitions	202
15.2 Hygiene promotion and community participation in the disaster-management cycle	203
15.3 Community participation	204
15.3.1 <i>Principles of community participation</i>	206
15.3.2 <i>Obstacles to community participation</i>	207
15.3.3 <i>Overcoming obstacles and reaching the community</i>	207
15.3.4 <i>Community organization in urban and rural areas</i>	209
15.4 Hygiene promotion and hygiene education	210
15.4.1 <i>Perception of risk and predisaster awareness raising</i>	210
15.4.2 <i>The need for hygiene promotion in emergencies</i>	211
15.4.3 <i>Setting up a hygiene promotion programme in an emergency</i>	211
15.4.4 <i>Participatory approach to hygiene promotion</i>	212
15.4.5 <i>Environmental health messages in emergencies</i>	213
15.4.6 <i>Communication methods</i>	213
15.4.7 <i>Choosing an approach</i>	214
15.5 Further information	214
<b>16. Human resources</b>	216
16.1 Professional staff	216
16.2 Volunteer staff and employed labour	217
16.3 Training	217
16.3.1 <i>Training professionals</i>	217
16.3.2 <i>Training volunteers</i>	218
16.3.3 <i>Integrated training exercises</i>	218
16.4 Further information	220
References	221
Websites	235
Annex 1 WHO model of country-level emergency planning	237
Annex 2 Equipment and supplies for environmental health activities in disasters and emergencies	240
Annex 3 Accidental pesticide poisoning	243
Annex 4 International and national actions in response to a radiation emergency	245
Annex 5 Selected information from the International Basic Safety Standards for Protection against Ionizing Radiation and for the Safety of Radiation Sources	248
Annex 6 Checklist of hygiene practices that protect health in emergencies and disasters	250