

# Contents

<b>1</b>	<b>The Ecosystem and Development</b>	<b>1</b>
	Ecosystem Characteristics	1
	Gaia	1
	Ecosystem Needs	2
	Ecosystem Changes/Disruptions – Responses and Effects Changes	3
	Response to Changes in Environmental Conditions	3
	Response to Ruptures in a Biome	5
	Ecosystem Renewal	5
	Ecosystem Resources – Are They Sustainable?	6
	Now and the Future	7
	Socio-Economic Keys to Development	7
	Economic	8
	Human Resources and Cultural Sensitivity	8
	Safety and the Physical Environment	9
	Afterword	9
<b>2</b>	<b>Populations: Growth, Braking, Contraction</b>	<b>11</b>
	Population Increase	11
	Agglomerations	12
	Global/National Population Increases	13
	The Fertility Influence	13
	Contraction/Depopulation	15
	Consequences of Aging and Depopulation	15
	Avoiding/Easing Immigration Problems	16
	Current and Projected Population Figures	17
	Trends in Economic Parameters vs Population Growth	19
	Age-Gender Distributions: Population Pyramids	20
	Examples of Population Pyramids	20
	Population Stabilization Structures	21
	Slowing But Growing Population Structures	21
	Contracting and Aging Population Structures	22
	Population Realities	22

Planned Population Growth - Social Stability or Disruption . . . . .	25
Planning . . . . .	27
Afterword . . . . .	28
<b>3 Population Needs for Well-Being . . . . .</b>	<b>29</b>
Biological/Chemical Needs . . . . .	30
Clean Air . . . . .	30
Safe Water . . . . .	31
Untainted Food . . . . .	31
Secure Waste Disposal . . . . .	32
Socio-Economic Needs . . . . .	32
Barriers to Meeting Population Needs . . . . .	33
Economic . . . . .	34
Politico-Cultural . . . . .	35
Human Rights . . . . .	36
Consequences of not Meeting Population Needs . . . . .	36
Proposal to Alleviate Tangible Needs Problems . . . . .	37
Additional Consideration: Technology Factor . . . . .	37
Space Needs - Physical Security . . . . .	38
Hazards Triggered by Human Settlement . . . . .	39
Population Density and Hazard Planning . . . . .	39
Planning for Future Population Changes . . . . .	41
Preparedness . . . . .	41
A Growing Societal Threat . . . . .	42
The Need to Cope with Global Warming/Climate Change . . . . .	42
Afterword . . . . .	44
<b>4 The Surface/Near-Surface Atmosphere . . . . .</b>	<b>45</b>
Part I . . . . .	45
Air Quality . . . . .	45
Meteorological Dispersion of Atmospheric Pollutants . . . . .	47
Climatologic Factors . . . . .	47
Dry Deposition - Particles . . . . .	48
Wet Precipitation - Dissolved and Solid Loads . . . . .	48
Natural Input to Atmospheric Composition . . . . .	49
Volcanoes, Fumaroles, Thermal Vents, Hot Springs . . . . .	50
Gases of Biological Origin - Fauna and Flora . . . . .	52
Emanations from Mineral Deposits/Soils/Rocks . . . . .	52
Evasion from Sea Water . . . . .	52
A Methane Threat . . . . .	53
Wind-Lifted, Wind-Driven, Wind-Deposited Particles . . . . .	53
Anthropogenic Intrusions to Air Quality . . . . .	54
Combustion of Fossil Fuels . . . . .	55
Smelters . . . . .	56
Mineral Extraction Other Than Smelting . . . . .	57

Industrial/Manufacturing Production .....	58
Reduction of Regional Air Pollution .....	59
Hg: Atmospheric Reduction - Success and Failure .....	60
Summary of Industrial Anthropogenic Pollution Sources .....	61
Industrial Accidents - Slugs with Short- and Long-Term Effects .....	61
Chemical .....	61
Nuclear .....	64
During Plant Operation .....	64
During Radioactive Waste Storage .....	65
Indoor Air Pollution .....	65
In-Home Atmospheres .....	67
Carbon Monoxide and Volatile Heavy Metals .....	67
Radon .....	67
Workplace Bad Air Problems .....	68
Part II .....	68
Assessing Atmospheric Chemistry Problems and Solutions .....	68
Global Atmospheric Problems .....	71
Global Warming/Climate Change .....	72
In-Line Capture of CO <sub>2</sub> : An Overlooked Opportunity? .....	75
Liquidize In-Line .....	75
Solidification .....	76
Regional: Acid Rain .....	76
Increasing Electrical Energy from Non-Fossil Fuel Sources .....	77
Regional/Local: Heavy Metals and Particles .....	77
Local: Smog .....	78
Emissions Controls - Costs/Benefits to Society and Ecosystems .....	79
Perspectives for Managing/Mitigating Air Pollution .....	79
Afterword .....	82
<b>5 Water: An Essential, Limited, Renewable Resource .....</b>	<b>83</b>
Part I .....	83
Clean and Available Water = Health, Development, Prosperity .....	83
Water Quality .....	83
Safe Water Standards .....	84
Hydrologic Cycle .....	85
The Earth's H <sub>2</sub> O: Where, How Much, How Used? .....	87
H <sub>2</sub> O Reservoirs: Oceans, Ice Caps and Glaciers, Aquifers, Lakes, Rivers, Moisture .....	87
Some Domestic and Other Sector Water Uses .....	89
Geographic Realities of Water Availability .....	91
Dealing with Problems of Water Deficits .....	93
Import via Aqueducts and Canals .....	95
Desalination .....	97
Recycling with Chemical Treatment .....	98
Recycle Without Chemical Treatment: Nanofiltration .....	98

Import via Sea-Towed Containers .....	99
Seasonal Supplies and Yearly Shortages .....	99
Limitations to Coping With Water Supply and Quality .....	99
Part II .....	100
Water Chemistry and Pollutant Inventory .....	100
Natural Controls on Water Chemistry .....	100
Sources of Water Pollutants .....	102
Natural .....	102
Ore Minerals .....	103
Anthropogenic Sources .....	103
Industry and Manufacturing .....	105
Agriculture .....	105
Waste Disposal Sites .....	106
Pollutant-Bearing Precipitation .....	107
Inadvertent Water Pollution from Human Activities .....	107
Example from the Sub-Continent .....	107
Alleviating/Eliminating Water Problems .....	108
Political Strategy .....	109
Social Strategy .....	109
Economic Strategy .....	111
Afterword .....	111
<b>6 Soil Formation, Quality, Sustainability .....</b>	<b>113</b>
Soil: Generic Definition .....	113
Societal Need: Productive Soils .....	113
Soil Formation .....	115
Disintegration + Decomposition = Weathering .....	116
Factors That Play Roles in Weathering and Soil Formation .....	117
Rock Type .....	117
Climate and Vegetation .....	118
Topography .....	119
Drainage .....	119
Time .....	121
Products of Weathering .....	121
Soil Horizons - Soil Classification .....	121
Horizons .....	121
Classification .....	123
Soil Quality: Indicators and Concerns .....	124
Quality Indicators .....	124
Organic Matter .....	125
Aggregate Stability .....	125
Crusts .....	126
Water Infiltration .....	126
pH .....	126

Soil Degradation .....	128
Global Extent and Causes .....	129
Practices to Reduce Soil Degradation .....	133
Preparation, Planting .....	133
Nutrient Replenishment, Salination Control, Pollutant Extraction ..	135
The Reality of Food Deficits .....	136
Global Food Production: Increase Followed by Decrease? .....	136
Sustainability of Productive Soils .....	137
Afterword .....	138
 <b>7 “Green” Legislation: Now for the Future .....</b>	<b>139</b>
Legislative Targets .....	139
Cornerstones of Environmental Regulations .....	140
Legislative Structures .....	141
Limitations .....	141
Clean Air Regulations - Progress, Advances, Successes .....	142
Global, Transnational, Regional, National, Local .....	143
Smog .....	144
Volatile Organic Compounds - VOCs .....	145
Particles .....	148
Acid Rain .....	148
Pb, Hg and Other Heavy Metals in the Atmosphere .....	149
Radiation .....	150
Industrial Catastrophes and Killer Air - Despite Regulations .....	151
Chemical .....	151
Radioactivity - Despite Regulations Chernobyl Failed .....	151
Clean Water Regulations - Progress, Advances, Successes .....	152
Effectiveness of an Enforced Clean Water Act .....	153
Quality of Life .....	154
New Home Construction Limited by Safe Water Availability .....	154
Agriculture .....	154
Commerce .....	155
Recreation and Tourism .....	155
Clean Soil Regulations - Environmental Status .....	155
German Approach .....	156
Danish Approach .....	157
State/Province Role .....	157
Revisiting Legislation: Closing Loopholes/Modifying Norms .....	157
Cap and Trade or Buy/Invest and Earn - Interim Tactics .....	159
Limitations to Change - Opportunity for Change .....	161
Government Legal Action to Curb Wetlands Destruction .....	162
Government, Citizens’ Legal Action to Curb Air Pollution .....	162
Use Best Available or Best Affordable Technology .....	163
Paths to Compliance with Environmental Safeguards .....	163
“Green” Precepts and Legislation .....	165
Afterword .....	167

<b>8</b>	<b>Proactive Planning in Industrial/Agricultural Development:</b>	
	<b>Minimizing Chemical Pollution</b> . . . . .	169
	Economic Development Aims and Requirements . . . . .	169
	Identifying Pollution: Chemical Baselines . . . . .	170
	Baseline Values in Pristine Areas . . . . .	171
	Samples . . . . .	171
	Analysis . . . . .	172
	Calculation . . . . .	172
	Baseline Levels for Contaminated Areas . . . . .	173
	Development Planning/Monitoring to Detect Chemical Pollution . . . . .	173
	Biocide/Fertilizer Application Controls . . . . .	174
	Easing Ecosystem Problems from Biocides and Fertilizers . . . . .	175
	Planning for an Improved Food Supply: Yield, Quality, Minimum Use of Chemicals . . . . .	175
	Genetic Engineering: Manipulation of Interspecies Properties . . . . .	176
	Health Concerns: Present and Future . . . . .	176
	Conventional Hybridization . . . . .	178
	Marker-Assisted Selection (MAS) for Conventional Intraspecies Hybridization . . . . .	178
	MAS Information Sharing . . . . .	179
	Nutrient Replenishment . . . . .	179
	Nutrient Replenishment: Natural, Natural With Treatment . . . . .	180
	Organic Agriculture Without and With Natural Component Chemicals . . . . .	181
	Without Herbicides . . . . .	182
	Organic Farm Products . . . . .	182
	Seawater Farming: Integrated Agriculture/Aquaculture . . . . .	183
	Planning for Chemical Problems in Global Warming Scenarios: The Future is Now . . . . .	184
	Global Warming Effect on Atmospheric Chemistry . . . . .	185
	Global Warming Effects on Water and Soil Chemistry . . . . .	186
	Climate Shifts . . . . .	187
	Planning and Investment . . . . .	191
	Afterword . . . . .	192
<b>9</b>	<b>Remediation/Reclamation Options for Polluted Environments:</b>	
	<b>Feasible or Not</b> . . . . .	193
	Two Pollution/Remediation Scenarios: Present and Past . . . . .	194
	Alleviation/Elimination of Pollution Problems: Possibilities . . . . .	195
	Preempting Remediation with Investment: Benefits >> Costs . . . . .	196
	Atmosphere . . . . .	197
	Capture/Immobilize Technologies . . . . .	197
	Particle Capture . . . . .	198
	Electrostatic Precipitators . . . . .	199
	Baghouses . . . . .	199

Cyclonic, Gravitational, Inertial Systems .....	199
Recycling .....	200
Costs and Benefits .....	200
Waters .....	201
Heavy Metals and Organic Chemicals in Surface Water Bodies ....	201
Nutrient-Rich Runoff – Alleviation + Control = Remediation ....	202
Oceans and Aquifers: Food Source and Water Source .....	203
Oceans .....	203
Aquifers .....	206
Soils .....	207
Excavation .....	207
Mobilization and Extraction - Physical-Chemical-Biological .....	209
Immobilization .....	209
Phytoremediation .....	210
Marker-Assisted Selection (MAS) Hybrids for Soil Remediation ...	212
Selected Crops for Contaminated Farmlands .....	212
In-Situ Degradation of Hydrocarbons .....	213
Control Salination and Preserve Soil Productivity .....	214
Remediation Realities .....	215
<b>Epilogue .....</b>	<b>219</b>
<b>References .....</b>	<b>221</b>
<b>Index .....</b>	<b>227</b>





Demands of Expanding Populations and Development  
Planning

Clean Air, Safe Water, Fertile Soils

Siegel, F.R.

2008, XX, 228 p. 27 illus., Hardcover

ISBN: 978-3-540-78806-5