

## Contents

<i>Foreword by James Gustave Speth</i>	<i>page xi</i>
<i>Preface</i>	<i>xiii</i>
<b>Part I Framework and Fundamentals</b>	<b>1</b>
1 Overview and Summary	3
1.1 Outline of the Book	4
1.2 Rationale and Motivations	10
1.3 Brief History and Summary of Sustainomics	17
1.4 SD Status and SDGs	22
2 Sustainomics Framework	26
2.1 Overview	26
2.2 Basic Concepts and Principles	26
2.3 Key Elements of the Sustainable Development Triangle	35
2.4 Integration of Economic, Social and Environmental Elements	41
2.5 BIGG to Restructure Development for Sustainability	51
2.6 Tools and Methods for Integrated Analysis and Assessment	60
3 Economics of the Environment	73
3.1 Overview	73
3.2 Human Activities and the Environment	73
3.3 Conventional Project Evaluation	74
3.4 Measuring Costs and Benefits	79
3.5 Basic Concepts for Valuing Environmental Costs and Benefits	83
3.6 Multicriteria Analysis	89
3.7 Discount Rate, Risk and Uncertainty	92
3.8 Economywide Policies and the Environment	96
Annex 3.1 Estimating and Using Shadow Prices	106
4 Environmental and Social System Links	111
4.1 Overview	111
4.2 Conceptual Framework Linking Ecological and Socioeconomic Systems	112
	vii

viii	<i>Contents</i>	
4.3	Property Rights, Governance and Ecological–Social Linkages	120
4.4	Sustainable Values and EA and SA	129
<b>Part II</b>	<b>Global and Transnational Applications</b>	<b>133</b>
5	Global Analytical Applications	135
5.1	Overview	135
5.2	Climate Change and Sustainable Development	135
5.3	Applying the Sustainomics Framework to Climate Change	138
5.4	Climate Change Adaptation and Mitigation	149
5.5	Global-Level Interactions between Climate Change and Sustainable Development	153
5.6	GHG Mitigation Prospects in Sri Lanka	158
5.7	Real-Options Framework for Carbon Trading under Uncertainty	174
6	International Process Applications: Multilevel, Multistakeholder, Transdisciplinary Dialogues	181
6.1	Overview	181
6.2	Global Transdisciplinary Scientific Dialogue on Climate Change and Sustainable Development	181
6.3	Sustainable Sri Lanka Vision 2030 Report and Building the National Consensus	186
6.4	Key Policy Actions and 2030 Outcomes	189
6.5	DDP: Multilevel, Multistakeholder Dialogue	203
6.6	DDP Evaluation Results and Conclusions	208
<b>Part III</b>	<b>National and Macroeconomic Applications</b>	<b>217</b>
7	National Economywide Applications	219
7.1	Overview	219
7.2	Historical Evolution of Ideas	220
7.3	Empirical Evidence	223
7.4	Framework for Analysis	227
7.5	Case Study of Brazil – Making Long-Term Development More Sustainable	233
8	Mathematical Macromodel Applications	250
8.1	Overview	250
8.2	Optimal Growth Models and Sustainable Development	250
8.3	Economic and Noneconomic Costs and Benefits of Growth	251
8.4	An Optimization Model: Ecol-Opt-Growth-1	253
8.5	Model Conclusions	256
8.6	Macroeconomic Policies, Second-Best Theory and Environmental Harm	263
8.7	DC Case Studies	266

<i>Contents</i>		ix
Annex 8.1	Ecol-Opt-Growth-1 Model	271
Annex 8.2	Second-Best Nature of Macroeconomic Policies When Environmental Externalities Are Present	277
9	Computable General Equilibrium Modeling Applications	280
9.1	Overview	280
9.2	Economywide Cross Effects of Social and Environmental Policies in Chile	280
9.3	Review of Economic, Social and Environmental Issues and Policies	284
9.4	Interactions between Social, Environmental and Economic Policies	292
9.5	Chile Case Study Conclusions	299
9.6	Economywide Policies and Deforestation in Costa Rica	301
9.7	Modeling Approach	304
9.8	Main Findings of the Costa Rica Study	311
Annex 9.1	ECOGEM – Chile CGE Model Summary	316
Annex 9.2	Costa Rica CGE Model Summary	319
<b>Part IV</b>	<b>Sectoral and Resource System Applications</b>	<b>323</b>
10	Energy Sector Applications	325
10.1	Overview	325
10.2	Energy and Sustainable Development	325
10.3	Framework for SED	335
10.4	Applying SED to Power Planning in Sri Lanka	347
10.5	Energy Policy Options	352
10.6	Assessing the Sustainability of Energy Policies in South Africa	357
11	Transport Sector Applications	365
11.1	Overview	365
11.2	Generic Priorities for Sustainable Transport	365
11.3	Health Costs of Air Pollution in Sri Lanka	368
11.4	Traffic Congestion – Economic and Environmental Sustainability	374
11.5	Other Options for Reducing Traffic Congestion	385
11.6	Sustainable Transport Policy in Sri Lanka	396
12	Water Resource Applications	402
12.1	Overview	402
12.2	Hydrological Cycle and Human Actions	402
12.3	Water and Development	406
12.4	Sustainable Water Resources Management and Policy	414
12.5	Management of Groundwater Depletion and Saline Intrusion in the Philippines	419
12.6	Policy Implementation Issues	425

x	<i>Contents</i>	
	12.7 Simple Water Filtration Method for Cholera Prevention in Bangladesh	429
	Annex 12.1 Economic Costs of Producing Water	433
13	Agricultural and Land-Use Applications	436
	13.1 Overview	436
	13.2 Sustainable Management of Tropical Forests	436
	13.3 Valuing Forest Ecosystems in Madagascar	447
	13.4 Sustainable Agriculture and Climate Change	454
	13.5 Climate Impacts on Agriculture in Sri Lanka	457
	Annex 13.1 Models Used for Tropical Forest Valuation	470
14	Sustainable Pricing Policy Applications	473
	14.1 Overview	473
	14.2 SPP for Energy	473
	14.3 Extensions of the Basic Model	480
	14.4 Calculating Economically Efficient Prices Based on Strict LRMC	489
	14.5 Adjusting Efficient Prices to Meet Other Objectives	494
	14.6 Sustainable Pricing of Water Resources	499
	Annex 14.1 Optimal Energy Pricing	505
	Annex 14.2 Demand Analysis and Forecasting	511
	<b>Part V Project and Local Applications</b>	517
15	Project and Business Applications	519
	15.1 Overview	519
	15.2 Small Hydro Projects and SED in Sri Lanka	519
	15.3 Main Findings of the Small Hydro Study	524
	15.4 New and Renewable Energy Projects: Case Study of Solar pv	528
	15.5 Sustainable Rural Electrification Based on Renewable Energy	535
	15.6 Evaluating a Typical Water Supply Project in a Poor African Village	553
	15.7 Sustainable Consumption and Production	561
16	Disaster and Human Habitat Application	570
	16.1 Overview	570
	16.2 Sustainable Hazard Reduction and Disaster Management	570
	16.3 The 2004 Asian Tsunami: A Preliminary Assessment	583
	16.4 Urban Vulnerability, Natural Hazards and Environmental Degradation	595
	16.5 Urban Sustainability	600
	<i>Bibliography</i>	613
	<i>Index</i>	665