

Contents

<i>Detailed table of contents</i>	xi
<i>List of illustrations</i>	xxiii
<i>Author biographies</i>	xxvi
<i>Preface</i>	xxvii
<i>Acknowledgments</i>	xxix
Overview	1
PART I	
The multidimensional concept of sustainability	29
1 Concern for a global future	31
2 The emergence of sustainable development	105
PART II	
Economic development, globalization, and sustainability	161
3 Economic development and prosperity: current theory and debate	163
4 Globalization: technology, trade regimes, capital flows, and the global financial system	264
5 Technological change, globalization, and sustainability	334
PART III	
Industrial policy and the role of the firm in pursuing sustainable development	403
6 The importance of technological innovation	405

x	<i>Contents</i>	
7	The role of the industrial firm in achieving sustainable development	423
8	Government policies to foster innovation, economic growth, and employment	469
	PART IV	
	National, regional, and international efforts to advance health, safety, and the environment	523
9	Regulatory regimes to protect health, safety, and the environment: the United States experience	525
10	Regional and international regimes to protect health, safety, and the environment	574
	PART V	
	International trade and energy	635
11	Trade regimes and sustainability	637
12	Climate change and energy challenges	695
	PART VI	
	Strategic policy design for sustainable transformations	711
13	Pathways to sustainability: co-optimizing economic development, the environment, and employment and earning capacity	713
	<i>Index</i>	747

Detailed table of contents

Overview	1
0.1 <i>Introduction</i>	1
0.2 <i>The multidimensional character of sustainability</i>	2
0.3 <i>The unsustainable industrial state</i>	3
0.4 <i>Sustainability at a crossroads</i>	6
0.5 <i>Globalization</i>	8
0.6 <i>Drivers of economic growth and development</i>	9
0.6.1 <i>Strategies to enhance competitiveness</i>	9
0.6.2 <i>The consequences of different industrial strategy options for workers</i>	10
0.7 <i>Conceptualizations of sustainable development</i>	13
0.7.1 <i>The interrelatedness of the economy, the environment, worker health and safety, and employment, and the need to address them together</i>	13
0.7.2 <i>Sustaining and disrupting innovation distinguished (for an expanded discussion, see Section 8.2 in Chapter 8)</i>	14
0.7.3 <i>A capsule definition of sustainable development</i>	16
0.8 <i>Governance options for achieving a transformation to a more sustainable state</i>	17
0.9 <i>The role of national governments</i>	17
0.10 <i>The necessity of solving problems on a comprehensive basis</i>	22
0.11 <i>The way forward</i>	23
0.12 <i>Additional readings</i>	25
0.13 <i>Recommended books</i>	25
0.14 <i>References</i>	26
PART I	
The multidimensional concept of sustainability	29
1 Concern for a global future	31
1.1 <i>Human needs and sustainability</i>	32
1.1.1 <i>The measurement of (human) development</i>	38
1.1.2 <i>Consumption and well-being</i>	50
1.1.3 <i>Employment and well-being</i>	54

xii *Detailed table of contents*

- 1.2 *Social justice, inequality, and the social contract between the governed and the government* 57
 - 1.2.1 *The social contract and the theory of justice* 58
 - 1.2.2 *Equality of what?* 65
 - 1.2.3 *Rising inequality* 71
- 1.3 *Living beyond our ecological means: the technology debate* 73
 - 1.3.1 *Growth, technology, and substitution versus a steady-state economy* 73
 - 1.3.2 *The environment and affluence: the environmental Kuznets curve* 78
 - 1.3.3 *Technological optimism* 81
 - 1.3.4 *The reformulation of sustainable development in terms of tipping points* 84
- 1.4 *Rationalizing the competing pressures on sustainability* 87
- 1.5 *Additional readings* 88
- 1.6 *References* 89

2 The emergence of sustainable development 105

- 2.1 *Components of sustainable development* 106
- 2.2 *The U.S. environment and development agenda* 108
- 2.3 *The creation of an international environmental agenda* 112
 - 2.3.1 *Stockholm+10* 118
 - 2.3.2 *The limits to growth debate* 119
- 2.4 *The emergence of sustainable development* 123
 - 2.4.1 *Our Common Future and the Earth Summit* 134
 - 2.4.2 *The Earth Summit II and III* 142
 - 2.4.3 *Rio+20 and the green economy* 144
 - 2.4.4 *The 2015 Sustainable Development Goals (SDGs)* 146
- 2.5 *The critical importance of employment* 149
- 2.6 *Additional readings* 155
- 2.7 *References* 155

PART II

Economic development, globalization, and sustainability 161

3 Economic development and prosperity: current theory and debate 163

Part one: current theory 164

- 3.1 *The meaning of economic development* 164
 - 3.1.1 *Growth and development distinguished* 164
 - 3.1.2 *Factor endowments and the classification of capital* 165
- 3.2 *Theories and perspectives on economic growth* 167
 - 3.2.1 *Neoclassical growth theory: the Solow model* 168
 - 3.2.2 *New growth theory: Romer's model* 169
 - 3.2.3 *The Ayres–Warr analysis* 172

3.2.4	<i>Implicit assumptions about technological innovation in neoclassical, environmental, and ecological economics</i>	174
3.2.5	<i>Peak oil and economic growth</i>	175
3.3	<i>Technological development and growth theory</i>	178
3.3.1	<i>Technological change</i>	178
3.3.1.1	<i>The long waves</i>	179
3.3.1.2	<i>The information or postindustrial revolution</i>	185
3.3.2	<i>Joseph Schumpeter's "creative destruction"</i>	194
3.3.3	<i>Market structure and innovation</i>	197
3.4	<i>Critiques of, and alternatives to, the Northern growth model</i>	198
3.4.1	<i>Growth in developing economies and the Washington Consensus</i>	198
3.4.2	<i>Sustainability in practice: the cases of Kerala and Costa Rica</i>	201
	Part two: emerging debates	208
3.5	<i>What lies ahead for economic growth and development in industrialized and developing economies?</i>	208
3.5.1	<i>The end of sustainable growth?</i>	208
3.5.2	<i>The impact of economic growth on employment and on the concentration of wealth and income in the developed world</i>	210
3.5.3	<i>The next industrial revolution?</i>	219
3.6	<i>Increasing the earning capacity of individuals, democratizing credit, and increasing investment in public goods</i>	220
3.6.1	<i>Binary economics</i>	220
3.6.1.1	<i>The theoretical fundamentals of binary economics</i>	221
3.6.1.2	<i>Implementing binary economics</i>	224
3.6.1.3	<i>Some policy implications of binary economics</i>	226
3.6.2	<i>Democratizing ownership</i>	226
3.6.3	<i>Microfinance</i>	231
3.7	<i>The new economics</i>	232
3.8	<i>De-[constructing] growth: decoupling profits from unsustainable production</i>	246
3.8.1	<i>Meanings and implications of growth</i>	246
3.8.2	<i>Fundamental changes in law are indispensable</i>	247
3.8.3	<i>Lessening the private sector resistance to sustainable transformations</i>	248
3.8.4	<i>Why tax labor and subsidize pollution?</i>	248
3.9	<i>Implications for policy</i>	249
3.10	<i>Additional readings</i>	250
3.11	<i>References</i>	251
4	Globalization: technology, trade regimes, capital flows, and the global financial system	
4.1	<i>Introduction</i>	264
4.2	<i>Globalization</i>	265

- 4.2.1 *Industrial globalization* 271
- 4.3 *Trade regimes* 274
 - 4.3.1 *The World Trade Organization* 275
 - 4.3.2 *The North American Free Trade Agreement* 275
 - 4.3.3 *The Trans-Pacific Partnership (TPP) and the Transatlantic Trade and Investment Partnership (TTIP)* 276
 - 4.3.4 *The Investor State Dispute Settlement (ISDS)* 283
 - 4.3.5 *The Japan–EU Economic Partnership Agreement* 285
- 4.4 *Trade and economic development* 285
 - 4.4.1 *Free trade: winners and losers* 286
 - 4.4.2 *Effects of trade on the structure of markets* 289
- 4.5 *The role of multinational enterprises in the international economy* 292
 - 4.5.1 *MNEs and neoclassical economics* 292
 - 4.5.2 *The centrality of foreign direct investment for development* 293
- 4.6 *Evolution of financial institutions* 297
 - 4.6.1 *Bretton Woods and its aftermath* 297
 - 4.6.2 *The benefits and perils of increased capital mobility* 299
 - 4.6.3 *Toward a new Bretton Woods?* 304
 - 4.6.4 *Steps toward a new financial architecture* 306
 - 4.6.4.1 *Rebuilding the intellectual foundation* 306
 - 4.6.4.2 *Setting the reduction of imbalances as the global imperative* 308
 - 4.6.4.3 *Floating a new monetary system: the Special Drawing Rights (SDR) proposal* 310
 - 4.6.4.4 *Establishing new institutions and governance mechanisms* 312
 - 4.6.4.5 *Passing micro- and macro-prudential regulation* 314
- 4.7 *The case of the EU* 318
- 4.8 *Additional readings* 325
- 4.9 *References* 325

5 Technological change, globalization, and sustainability

334

- 5.1 *Effects of globalization on economy–environment interactions (sector II)* 337
 - 5.1.1 *Development (industrialization) and the environment* 338
 - 5.1.1.1 *The relationship between economic development/growth and environmental quality: an analytic approach* 339
 - 5.1.1.2 *The relationship between environmental regulation and economic growth* 340
 - 5.1.2 *Trade (globalization) and the environment* 343
 - 5.1.2.1 *The positive impacts of free trade on environmental quality* 344
 - 5.1.2.2 *The adverse effects of free trade on the environment* 345

5.1.2.3	<i>The effects of stringent environmental regulation on trade and the environment</i>	348
5.1.3	<i>Global investment and the environment</i>	349
5.2	<i>Effects of globalization on economy-work interactions: sector IV</i>	356
5.2.1	<i>Income inequality and technological displacement</i>	358
5.2.2	<i>The international division of labor (resulting from multinationalization)</i>	366
5.2.3	<i>The creation of purchasing power</i>	371
5.2.4	<i>Technology-enabled capital mobility</i>	372
5.2.5	<i>The effects of trade on the economy and employment</i>	374
5.2.5.1	<i>The effects of trade in the developed world</i>	374
5.2.5.2	<i>The effects of trade in the developing world</i>	377
5.2.6	<i>MNEs: blessing or peril?</i>	379
5.3	<i>Effects of globalization on environment-work interactions: sector VI</i>	381
5.3.1	<i>Increasing the environmental footprint</i>	381
5.3.2	<i>The effects of a greener economy on employment</i>	383
5.3.3	<i>Immigration and population</i>	387
5.4	<i>Conclusion</i>	388
5.5	<i>Additional readings</i>	389
5.6	<i>References</i>	389

PART III

Industrial policy and the role of the firm in pursuing sustainable development	403
6 The importance of technological innovation	405
6.1	<i>Introduction</i> 405
6.2	<i>Types of innovation and the nature of technological change</i> 405
6.2.1	<i>Categorizing technological change</i> 405
6.2.2	<i>Evolutionary versus revolutionary change</i> 413
6.3	<i>National innovation systems</i> 415
6.4	<i>References</i> 420
7 The role of the industrial firm in achieving sustainable development	423
7.1	<i>Introduction</i> 423
7.2	<i>Pressures for corporate environmental responsibility</i> 424
7.3	<i>Responses of firms to social demands</i> 427
7.4	<i>Organizational innovation and learning</i> 429
7.4.1	<i>Organizational theory and the limitations of the neoclassical model</i> 430
7.4.2	<i>Organizational learning</i> 431
7.4.3	<i>Networks</i> 433
7.4.4	<i>Social networks: learning collaborations with stakeholders</i> 435

- 7.5 *Evolutionary or co-evolutionary transformations and customer satisfaction and values* 437
 - 7.5.1 *The means of delivering satisfaction to customers* 438
 - 7.5.2 *The nature of customer satisfaction* 439
 - 7.5.3 *Changes in customer behavior and values* 440
- 7.6 *The relationship between organizational learning and change and technological innovation* 440
 - 7.6.1 *Willingness* 441
 - 7.6.2 *Opportunity/motivation* 441
 - 7.6.3 *Capacity/capability* 441
 - 7.6.4 *Environmentally oriented evolutionary technological changes within firms* 443
 - 7.6.4.1 *I – Changes in internal environmental management practices* 443
 - 7.6.4.2 *II – Adopting and adapting better, existing off-the-shelf technologies (diffusion/incremental innovation)* 444
 - 7.6.4.3 *III – Development of new technologies and new applications of existing technologies by existing firms (mostly involving sustaining innovation)* 446
 - 7.6.5 *Is evolutionary change enough?* 448
 - 7.6.6 *Environmentally oriented technological changes outside existing firms* 450
 - 7.6.6.1 *IV – Displacement of a problematic technology (product or process) by a new entrant (who mostly develops disrupting innovation)* 450
 - 7.6.6.2 *V – System change necessitating a reorientation or reorganization of industry* 452
- 7.7 *Innovation to stimulate employment* 452
 - 7.7.1 *Low-wage, cost-cutting versus innovation driven, quality firm strategy* 456
 - 7.7.2 *Re-conceptualizing the need for innovation in approaches to employment enhancement* 458
- 7.8 *Policy implications* 459
- 7.9 *Additional readings* 460
- 7.10 *References* 460

8 Government policies to foster innovation, economic growth, and employment

- 8.1 *Introduction* 469
- 8.2 *Types of technological change and sustaining and disrupting innovation* 471
- 8.3 *The role of government in promoting innovation in developed countries* 480
 - 8.3.1 *The innovation process: distinguishing singular product and process changes from systemic innovation* 481

- 8.3.2 *Theories of system innovation* 484
- 8.3.3 *Strategic niche management and transition management* 487
- 8.3.4 *A stronger role for government* 493
- 8.3.5 *Regulation-induced innovation as an alternative pathway to achieving sustainable development* 496
- 8.3.6 *The importance of diffusion in achieving sustainable development* 500
- 8.4 *Stakeholder involvement in the context of sustainable development* 501
- 8.5 *Innovation, industrial, and technology policy in the context of a globalized economy* 506
- 8.6 *Modernization, globalization, and employment in the industrialized economies* 507
- 8.7 *Industrial and employment policy in emerging economies* 509
- 8.8 *Additional readings* 510
- 8.9 *References* 511

PART IV

National, regional, and international efforts to advance health, safety, and the environment 523

9 Regulatory regimes to protect health, safety, and the environment: the United States experience 525

- 9.1 *Introduction* 526
- 9.2 *The nature of pollution and justification for government intervention* 526
- 9.3 *Approaches to the pollution problem* 527
- 9.4 *Choosing the instruments of intervention* 528
 - 9.4.1 *Direct controls* 528
 - 9.4.2 *Indirect controls* 529
 - 9.4.3 *Liability statutes and common law suits* 529
 - 9.4.4 *Voluntary initiatives* 529
 - 9.4.5 *Encouraging the adoption of cleaner and inherently safer technology* 530
- 9.5 *Principles of environmental, health, and safety law* 530
 - 9.5.1 *The polluter pays principle* 530
 - 9.5.2 *The precautionary principle* 531
 - 9.5.3 *The preference for pollution prevention and inherently safer production* 534
 - 9.5.4 *The principle of extended producer responsibility for products and chemicals, and lifecycle considerations* 535
- 9.6 *The U.S. regulatory system* 536
 - 9.6.1 *Introduction to the U.S. system* 536
 - 9.6.2 *Media-based initiatives* 536

- 9.6.2.1 *The workplace: the Occupational Safety and Health Act (1970)* 536
 - 9.6.2.1.1 *Key OSHA standards* 537
 - 9.6.2.1.2 *Regulatory challenges and the role of the federal courts* 538
- 9.6.2.2 *The ambient air: the Clean Air Act (1970, 1977, 1990)* 539
 - 9.6.2.2.1 *National ambient air quality standards for criteria pollutants* 539
 - 9.6.2.2.2 *National emission standards for hazardous air pollutants* 540
 - 9.6.2.2.3 *Prevention of chemical accidents* 541
 - 9.6.2.2.4 *Regulation of greenhouse gases* 542
- 9.6.2.3 *Surface waters and drinking water* 542
 - 9.6.2.3.1 *The Clean Water Act (1972, 1977, 1987)* 542
 - 9.6.2.3.2 *The Safe Drinking Water Act (1974, 1986, 1996)* 545
- 9.6.2.4 *The land and subsurface waters* 545
 - 9.6.2.4.1 *The Resource Conservation and Recovery Act (1976, 1984)* 546
 - 9.6.2.4.2 *The Comprehensive Environmental Response, Compensation, and Liability Act (1980, 1986)* 546
- 9.6.3 *Chemical-based statutes* 547
 - 9.6.3.1 *The Emergency Planning and Community Right to Know Act (1986)* 547
 - 9.6.3.2 *The Toxic Substances Control Act (1976, 2016)* 548
 - 9.6.3.2.1 *The first forty years* 548
 - 9.6.3.2.2 *The 2016 amendments* 550
 - 9.6.3.3 *Chemicals in pesticides, food additives, pharmaceuticals, and consumer products* 552
- 9.6.4 *Laws integrating pollution reduction into federal decision-making* 554
 - 9.6.4.1 *The National Environmental Policy Act (1969) and the Endangered Species Act (1973)* 554
 - 9.6.4.2 *The Pollution Prevention Act (1990)* 555
- 9.7 *Deciding the extent of intervention* 556
 - 9.7.1 *Trade-off analysis distinguished from cost–benefit analysis* 556
 - 9.7.2 *Trade-off analysis in the context of sustainability* 565
 - 9.7.2.1 *Operationalizing the social contract* 565
- 9.8 *Static versus dynamic efficiency and the implications for promoting technological innovation using trade-off analysis* 569
- 9.9 *References* 571

10 Regional and international regimes to protect health, safety, and the environment	574
10.1 <i>Introduction</i>	575
10.1.1 <i>Concepts addressed in this chapter</i>	575
10.1.2 <i>The broader picture</i>	576
10.2 <i>Regional approaches to protect health, safety, and the environment: the European Union</i>	577
10.2.1 <i>Environmental law in the European Union</i>	577
10.2.2 <i>Regulation of air pollution, water pollution, and waste</i>	582
10.2.2.1 <i>Air pollution</i>	582
10.2.2.2 <i>Water pollution</i>	583
10.2.2.3 <i>Waste</i>	584
10.2.2.3.1 <i>In general</i>	584
10.2.2.3.2 <i>The WEEE directive</i>	585
10.2.3 <i>The Industrial Emissions Directive (Integrated Pollution Prevention and Control)</i>	586
10.2.4 <i>The Integrated Product Policy</i>	588
10.2.5 <i>Prevention of chemical accidents</i>	589
10.2.6 <i>Access to information and participatory rights</i>	590
10.2.7 <i>Chemicals policy and REACH</i>	590
10.2.8 <i>Food safety</i>	593
10.2.9 <i>Biotechnology</i>	594
10.2.10 <i>Environmental liability</i>	597
10.2.11 <i>Worker health and safety</i>	598
10.2.12 <i>The potential for EU environmental law to promote sustainability</i>	599
10.2.13 <i>Comparative summary of U.S. and EU environmental laws</i>	599
10.3 <i>The nature of international environmental law</i>	602
10.3.1 <i>Treaties, customs, and principles as elements of international environmental law</i>	603
10.3.2 <i>Three evolving principles of international environmental law: the polluter pays, precautionary, and intergenerational equity principles</i>	604
10.3.3 <i>“Hard” versus “soft” law</i>	607
10.3.4 <i>Regulation of hazardous chemicals</i>	608
10.3.4.1 <i>The 1989 Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal</i>	608
10.3.4.2 <i>The 1998 Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides on International Trade</i>	609

10.3.4.3	<i>The 2001 Stockholm Convention on Persistent Organic Pollutants</i>	609
10.3.4.4	<i>General considerations</i>	611
10.3.5	<i>Polluting the international commons</i>	611
10.3.6	<i>Preserving biodiversity and endangered species</i>	612
10.3.7	<i>Food safety</i>	613
10.3.8	<i>Biotechnology</i>	614
10.3.9	<i>The public's right to access information and to participate in environmental, health, and safety matters</i>	615
10.3.10	<i>Worker health and safety</i>	617
10.4	<i>The importance of international institutions</i>	618
10.4.1	<i>The International Labour Organization (ILO)</i>	620
10.4.2	<i>The United Nations (UN)</i>	621
10.4.2.1	<i>The United Nations Environment Programme (UNEP)</i>	622
10.4.2.2	<i>The United Nations Industrial Development Organization (UNIDO)</i>	623
10.4.2.3	<i>The United Nations Development Programme (UNDP)</i>	624
10.4.3	<i>The World Health Organization</i>	626
10.5	<i>Global governance</i>	626
10.6	<i>Conclusions</i>	628
10.7	<i>Additional readings</i>	629
10.8	<i>References</i>	629

PART V

International trade and energy 635

11 Trade regimes and sustainability 637

11.1	<i>Introduction</i>	637
11.1.1	<i>Trade as a driver of growth</i>	638
11.1.2	<i>Overview of the agreements administered by the World Trade Organization</i>	643
11.1.3	<i>Dispute resolution under the WTO</i>	645
11.1.4	<i>The prohibition against subsidies</i>	650
11.1.4.1	<i>Foreign sales corporations advantaging automobile exports</i>	652
11.1.4.2	<i>Aircraft</i>	652
11.1.4.3	<i>Solar panels</i>	652
11.1.5	<i>Other anti-competitive practices: rare earths from China</i>	653
11.1.6	<i>Countervailing duties as a defensive measure</i>	653
11.2	<i>Trade and the environment (trade regimes as constraints on national health, safety, and environmental policies)</i>	654
11.2.1	<i>Thailand-Cigarettes</i>	655

- 11.2.2 *The shrimp-turtle dispute and Article XX(g) of the GATT (conservation of natural resources)* 655
- 11.2.3 *Asbestos and Section XX(b) of the GATT (protection of human and animal life and health)* 658
- 11.2.4 *Trade and standards under the WTO agreements* 662
- 11.2.5 *The decision of the Appellate Body in the asbestos case and future uncertainty of the availability of Articles XX(b) and (g) exceptions* 665
- 11.2.6 *Restricting oil imports into the EU from Canadian tar sands: a missed opportunity* 666
- 11.2.7 *Food safety: hormones in beef and the SPS agreement* 666
- 11.2.8 *Biotechnology: genetically modified organism (GMO)-modified crops and food* 669
- 11.2.9 *General agreement on trade in services* 671
- 11.2.10 *The agreement on trade-related aspects of intellectual property rights* 671
- 11.3 *Trade and the environment (trade regimes as tools to promote advances in national and international environmental policies)* 672
 - 11.3.1 *Trade as a positive force to improve environmental conditions* 672
 - 11.3.2 *NAFTA and other U.S. bilateral trade regimes* 676
 - 11.3.3 *Other freetrade agreements (FTAs)* 677
- 11.4 *Trade, employment, and labor standards* 677
- Appendix 11-A: selected WTO agreement* 682
- 11.5 *References* 689

12 Climate change and energy challenges

695

- 12.1 *Introduction* 695
- 12.2 *Myths on innovation, sustainable development, and the low-carbon economy that need to be dispelled to devise effective strategies* 696
 - 12.2.1 *Myth #1: It is possible to realize mutual gains in industrial competitiveness, reduction of GHGs, and employment* 696
 - 12.2.2 *Myth #2: Technological innovation in products and services is essential to achieving deep decarbonization in industrial nations. It is argued that there is a serious “innovation deficit”* 697
 - 12.2.3 *Myth #3: Innovation per se fuels the industrial state and creates jobs* 698
 - 12.2.4 *Myth #4: Governments cannot pick winners. Winners pick governments* 699
 - 12.2.5 *Myth #5: Industrial policy is synonymous with innovation policy* 699
 - 12.2.6 *Myth #6: Regulation inhibits beneficial innovation* 699

xxii *Detailed table of contents*

- 12.2.7 *Myth #7: Carbon leakage presents a practical disincentive and limits to what regulation can achieve in terms of decarbonization* 700
- 12.2.8 *Myth #8: Trade in non-energy-related goods and services is a win-win proposition for all parties* 701
- 12.2.9 *Myth #9: Nations can “go it alone”* 702
- 12.3 *Recommended interventions* 702
- 12.4 *Additional readings* 704
- 12.5 *References* 704

PART VI

Strategic policy design for sustainable transformations 711

13 Pathways to sustainability: co-optimizing economic development, the environment, and employment and earning capacity 713

- 13.1 *Transformation challenges for the industrial state* 713
- 13.2 *Selected interventions from the perspective of the developed nation–state* 719
- 13.3 *Inequality, employment, wages, and earning capacity within the nation–state* 725
- 13.4 *Changes in globalization, trade, and the global financial system* 738
- 13.5 *Conclusion and reflections on economic growth, credit, environment, employment, trade, and a binary economy* 739
- 13.6 *References* 741

Index 747

Illustrations

Figures

0.1	The sources and drivers of unsustainability, resulting challenges, and solutions	4
0.2	Technological change and globalization as drivers of change within and between three operationally important dimensions of sustainability	14
0.3	Government activity areas and challenges confronting sustainable development	23
1.1	Drivers, challenges, and solutions for globalization within a context of human needs	38
1.2	A multidimensional representation of sustainable development in four countries	49
1.3	Factors that influence job and employment quality	55
1.4	Neoclassical economics view of growing cycles of production and consumption	76
1.5	Steady-state economics view of production and consumption cycles in equilibrium with the ecosystem	76
1.6	Environmental Kuznets curve for sulfur dioxide emissions	79
1.7	The accumulation of S-Curves for a technology set	82
2.1	The Sustainable Development Goals	147
3.1	Stylized graph of Schumpeter's waves of technology-based economic development	182
3.2	The historical record: bubble prosperities, recessions, and golden ages	184
3.3	World economic history in one picture	195
3.4	Average GHG footprint and income per person	218
5.1	Technological change and globalization as drivers of change within and between three operationally important dimensions of sustainability	336
5.2	Technological change and globalization as drivers of change within and between three operationally important dimensions of sustainability (Sectors I, II, and III)	337
5.3	World Foreign Direct Investment (net inflows) and global distribution of FDI	350
5.4	Net ODA and distribution of net ODA (USD)	351
5.5	Technological change and globalization as drivers of change within and between three operationally important dimensions of sustainability (Sectors III, IV, and V)	357
5.6	Change in employment by major occupational category, 1979–2012	360

xxiv *Illustrations*

5.7	Change in occupational employment shares in low-, middle-, and high-wage occupations in sixteen EU countries, 1993–2010	361
5.8	Key economic, productivity, and private employment trends, 1947–2012	363
5.9	Corporate profits as a percentage of GDP	364
5.10	Technological change and globalization as drivers of change within and between three operationally important dimensions of sustainability (Sectors I, VI, and V)	382
6.1	The dynamics of technological change	406
6.2	Simple linear model of technological innovation with feedback	407
6.3	The basic model of the sectoral/regional innovation system (embedded in social networks)	407
6.4	The important dimensions of technological change	414
6.5	Diagram of a generic innovation system	419
7.1	Different operating postures that might be adopted by government, corporations, workers, and consumers in the context of citizen, NGO, and shareholder scrutiny	426
7.2	The triangle of technical development	451
8.1	Matrix of potential outcomes of sustaining and disrupting product technology	473
8.2	Intersecting trajectories of performance demanded (dashed lines) versus performance supplied (solid lines) in a generic product market	474
8.3	Disrupting-technology S-Curve	476
8.4	The efficient frontier for current and future technology, contrasting sustaining and disrupting innovation	477
8.5	Matrix of potential outcomes of sustaining and disrupting technology for four different kinds of technological change or innovation	479
8.6	Technology push vs. market pull innovation	481
8.7	Traditional industrial policy interventions	482
8.8	A model for regulation-induced technological change for “weak” (Porter) and “strong” (Ashford/MIT) forms of the regulation-induced innovation hypothesis	498
8.9	The backcasting process	503
9.1	Trade-offs of EPA air- and water-pollution regulations	563
9.2	Trade-offs of banning chlorpyrifos	564
10.1	Relationship between international, U.S., and EU environmental law	576
11.1	Schematic of the WTO dispute-resolution process	648
12.1	Innovation and stringency of climate change policies	700
13.1	Technological change and globalization as drivers of change within and between three operationally important dimensions of sustainability	720

Tables

0.1	Evolution of approaches to health, safety, and environmental problems	15
0.2	Comparison of current and sustainable policy agendas	15
1.1	Limitations of GDP as a measure of (human) development	40
1.2	Alternatives to GDP as a measure of (human) development	43
1.3	Comparison of key features of the human development approach with the neoliberal alternative and the basic-needs antecedent	69
2.1	The Creation of a national environment and development agenda – 1951 to 1970	109

2.2	The creation of an international environmental agenda – 1971 to 1980	114
2.3	The emergence of sustainable development – 1981 to 2016	124
2.4	The MDGs and SDGs	148
2.5	Dernbach's (1998) five components of sustainable development and the principles of the Stockholm and Rio Declarations	150
3.1	Characteristics of major technological complexes	182
3.2	Rules of good behavior for promoting economic growth	199
4.1	The great globalization debate	270
5.1	Summary of the environmental–income relationship for different indicators	341
9.1	Examples of problem types that can be addressed using trade-off analysis	559
9.2	Generic matrix of policy consequences for different groups/regions	560
9.3	Using the trade-off matrix for a comparative analysis of policy alternatives	561
9.4	A classification of approaches to decision-making and evaluation	562
9.5	Types and outcomes of interactions between the government and stakeholders	566
10.1	Selected U.S. and EU environmental initiatives	600
11.1	The World Trade Organization (WTO)	644
13.1	Strategies to promote more sustainable industrial production and consumption	721
13.2	Strategies to improve health, safety, and the environment	722
13.3	Strategies to enhance meaningful, rewarding, and safer employment and adequate earning capacity	723
13.4	Strategies to promote more sustainable industrial trade	724

Boxes

0.1	The perfect storm	6
1.1	Key points relating to the environmental Kuznets curve (EKC)	80
1.2	Concern with global climate change	85
2.1	Critiques of the Earth Summit and the Rio Declaration	140
3.1	Adam Smith (1723–1790)	170
3.2	David Ricardo (1772–1823)	171
3.3	Thomas Robert Malthus (1766–1834)	196
3.4	Kerala's development model	201
3.5	Costa Rica	205
4.1	The 2008 financial meltdown	303
5.1	The Global Sullivan Principles	352
8.1	Theories of technological innovation and the role of government	484
10.1	Environmental governance in the European Union	578
10.2	The Single European Act of 1986	579
10.3	The 1992 Treaty of Maastricht	579
10.4	The 1997 Treaty of Amsterdam	580
10.5	EU legal framework for biotechnology	595
11.1	United States – import prohibition of certain shrimp and shrimp products	656
13.1	Stiglitz, J. (2013) <i>rewriting the rules</i> (excerpts from the executive summary, pp. 8–9)	715
13.2	Interventions to address inequality, wages, and purchasing power	727