

Index

Italic page numbers refer to figures, tables, and boxes.

Bold page numbers refer to the Summary.

A

- Accounts, 188, 189
- Aesthetic values, 57, 59
 - human well-being and, 77
- Affluence as factor of consumption, 88–89, 97
- Africa. *See also* Developing countries
 - energy, 28
 - fisheries, 28
 - life expectancy in, 98
 - water needs, 79
- Agriculture
 - climate change and, 97
 - cultivated reporting category, **11**, 55
 - degradation of land, **4**, 30, 64
 - economics and, 28
 - fertilizer use, **14**, **15**, **16–17**
 - grazing animals, effect of increase in, 68
 - subsidies, effect of, 82
 - sustainable use and production condition, 64
- Air quality, 57, 77, 104
 - indirect use values and, 133
- Analytical approaches, **20–23**, 41, 148–177
 - assessment of historical trends and current state of ecosystems and drivers, 150–151
 - Bayesian paradigm, 175–176
 - boundaries of ecosystems, **12**, 159–161
 - data for, **20–21**, 152–157. *See also* Data sets
 - decision analytical frameworks (DAFs), **24**, 195–200, 196
 - evaluation of possible responses, 151. *See also* Interventions and decision-making
 - human well-being and, 151
 - selection of indicators, 150
 - identification of categories of ecosystems and their services, 150
 - identification of direct and indirect drivers, 150
 - identification of links between services and human societies, 150, 156
 - major tasks of, 149, 149–152
 - modeling issues, **21–22**, 162–165
 - for scenario analysis, 171–173

- reporting units, 162
 - review and validation procedures, 174
 - scale selection and, 151–152, 160, 173–174
 - scenario analysis, **22–23**, 151, 166–173. *See also* Scenario analysis
 - selection of indicators, 150, 158–159
 - uncertainty analysis, **23**, 151, 175–177
 - units of analysis and reporting, 159–162
- Annan, Kofi, **1**, 48
- Aquatic Ecosystem Health and Management Society, 69
- Archive for data, 154, 157–158
- Assessments used in decision-making cycle, 188, 189. *See also* Analytical approaches

B

- Bayesian paradigm, 175–176
- Behavioral decision theory, 196
- Benefits transfer, 135–136
- Biases, minimization of, 45–47
- Biochemicals, 57, 57
- Biodiversity, **8–10**, 51
 - defined, **8**
 - ecosystem services and changes in, 60–62, 103
 - importance of, **10**, 77
 - intrinsic value of, 144
 - loss of species and, 61–62
 - substitutability of species, 61–62
- Biogeochemistry models, 163
- Biological control, 58
- Biological drivers of ecosystem change, **16**, 103–104
- Biomass
 - as scale-independent variable, 112–113
 - fuel, 28, 56, 57
- Biosphere, 72
- Birth rate, 98. *See also* Population fluctuations
- Black market, 144
- Boundaries of ecosystems, **12**, 51, 159–161, 160
 - multiscale assessment and, 124–126

C

Canada and cod fishing, 65

Carbon dioxide, 119–120

Carbon emissions, 30. *See also* Climate change

Catastrophic change, 68

Categories of ecosystems, 38, 50–53, 54–55. *See also* Ecosystem services
 identification of, 150
 reporting categories, 8, 10–11, 54–55

CBD. *See* Convention on Biological Diversity

Change in ecosystems. *See* Drivers of change

Chemical drivers of ecosystem change, 16, 103–104

Chipko (tree hugger) movement, 119

Climate change, 4, 28, 68
 agriculture and, 97
 as driver of ecosystem change, 4, 104
 scale issues and, 18, 120
 variability and ecosystem services, 68

Climate models, 164
 scale issues, 173
 scenario analysis, 172

Climate regulation, 14, 57, 58, 77

Coastal reporting category, 10, 54

Cod fishery, collapse of, 65

Computable general equilibrium (CGE) models, 165

Conceptual framework of ecosystem assessment, 2–3, 7–19, 9, 34–43, 37, 52
 analytical approaches, 41. *See also* Analytical approaches
 biases, minimization of, 45–47
 categories of ecosystem services, 38, 54–55. *See also* Categories of ecosystems
 change, factors for, 38–39. *See also* Drivers of change
 human well-being as focus of, 38, 52. *See also* Human well-being
 interrelationships of issues, 37
 interventions and decision-making, 41–42, 178–195. *See also* Interventions and decision-making
 multiscale structure and sub-global components, 39–40, 40, 43–44. *See also* Multiscale assessment
 need for agreement on, 34
 overarching questions guiding design, 35, 36, 173–177
 types of knowledge assessed, 44–45

valuation issues, 41. *See also* Valuation of ecosystems

Condition and Trends Working Group, 43, 152, 161

Conservation value, 133

Consumptive use of ecosystem services, 133
 affluence as factor, 88–89, 97

Convention on Biological Diversity (CBD), 2, 10, 44, 46, 52, 162
 on definition of ecosystem, 51, 52

Convention on Long-Range Transboundary Air Pollution, 189

Convention on Migratory Species, 2, 46

Convention to Combat Desertification, 2, 46, 162

Core data sets, 152–153

Cost-benefit analysis, 196

Cost-effectiveness analysis, 196

Cross-scale interactions, 17–19, 110–111, 124

Cultivated land. *See also* Agriculture
 reporting category, 11, 55

Cultural diversity, 58

Cultural services, 8, 57, 58–59
 human well-being and, 77
 sustainable use and, 65–66
 valuation related to, 133

Cultural values, 19, 57, 59, 128–129, 139–146
 as drivers of ecosystem change, 16, 102–103
 group contingent valuation (CV), 140

D

DAFs. *See* Decision analytical frameworks

Data sets, 20–21, 152–157
 archive for, 154, 157–158
 challenges in using, 154–157
 core data sets, 152–153
 for summaries and synthesis reports, 153
 indicator selection, 158–159
 local knowledge. *See* Traditional knowledge, use of
 metadata, 153–154
 new data sets, 153
 quality assurance, 157–158
 reliability of, 155
 reports to use, 153
 sources of data, 157–158
 traditional knowledge. *See* Traditional knowledge, use of

- types of bias, 155
 - unpublished information, use and validation of, 156–157, 174
 - Decentralized political decision-making, 100
 - Decision analytical frameworks (DAFs), **24**, 195–200, 196
 - Decision-making. *See* Interventions and decision-making
 - Definition of ecosystem, **3**, 51
 - Deliberation, 193
 - Demographic drivers. *See* Population fluctuations
 - Developing countries
 - collision of traditional societies and ecosystems, 198–199
 - data collection issues, 155
 - decision-making process in, 197
 - economic factors and, 99
 - energy, 28
 - fisheries, 28
 - megacities in, 97
 - population growth in, 96
 - water shortage and dam construction, 79
 - Direct use values, 133
 - Direct vs. indirect drivers, **15**, **16**, 87, 87, 92, 92, 150
 - Disease regulation, 57, 58, 77
 - Driver-Pressure-State-Impact Response (DPSIR), 89
 - Drivers of change, **15–17**, 38–39, 85–106
 - assessment of change in value, 137–139, 138
 - consequences of decisions outside of ecosystem, 94–96
 - cultural and religious values as, **16**, 102–103
 - decision-making process and, 91–94
 - defined, **15**, 86–87
 - demographic drivers, **16**, 96–98
 - economic drivers, **16**, 98–99
 - effect on human well-being, 73
 - endogenous vs. exogenous drivers, **15**, **16**, 87–88, 91, 92, 92, 93, 95–96
 - forecasting change, 167. *See also* Scenario analysis
 - global drivers, 90–91, 106
 - indirect vs. direct drivers, **15**, **16**, 87, 87, 92, 92, 150
 - integrated assessment and, 90
 - interactions among, **16–17**, 104–106
 - IPAT formulation for change factors (Impacts=Population x Affluence x Technology), 88
 - overview of, 90–91
 - physical, biological, and chemical drivers, 103–104
 - previous approaches to study of, 88–90
 - public sector decisions and, 94–96
 - scenario analysis and, 169
 - scientific and technological drivers, **16**, 100–102
 - selection for analysis, 150, 158–159
 - sequences of events leading up to change, 106
 - sociopolitical drivers, **16**, 99–100
 - synergetic interactions among, 105
 - typologies of, 87, 87
 - Dryland reporting category, **11**, 55
- ## E
- Eastern Europe and population decline, 97
 - Ecological footprint, 70
 - Economic drivers of ecosystem change, **4**, **6**, **16**, 98–99
 - Economic impact of ecosystems, 27–28
 - human system models' focus on, 165
 - valuation method. *See* Valuation of ecosystems
 - Ecosystem health, 69–70
 - Ecosystem services, **8–12**, 53–60
 - assessment of historical trends and current state of, 150–151
 - biodiversity and, 60–62
 - categories of, **8**, 56–60, 57
 - cultural services, **8**, 57, 58–59
 - identification of, 150
 - multisectoral approach, 60, 61
 - provisioning services, **8**, 56–57
 - regulating services, **8**, 57, 57–58
 - supporting services, **8**, 57, 59–60
 - changes in. *See* Drivers of change
 - defined, **3**
 - institutions mediating use of, 82–83
 - linkages with human well-being, 76–79, 78
 - research on, 56
 - selection of indicators for analysis, 150, 158–159
 - stability in, 66–69, 67
 - substitution of services, 61–62, 70

- Ecotourism. *See* Recreation and ecotourism
- Educational values, 57, 59
 environmental impact and, 97
 human well-being and, 77
- EEA. *See* European Environment Agency
- EIA. *See* Environmental impact assessment
- Endangered species, 6, 14, 144, 145–146
- Endangered Species Act (ESA), 145–146
- Endangered Species Committee, 146
- Environmental impact assessment (EIA)
 compared to Millennium Ecosystem Assessment, 42
 statements required prior to project development, 24, 194
- Environmental laws, 8, 23
 recognition of intrinsic value of, 144
 treaties, 185
- Environmental system models, 21–22, 162–164
 integrated models, 165
- Erosion control, 14, 58
- Ethical and cultural prescriptive rules, 196
- European Environment Agency (EEA)
 decision-making framework of, 190
 science assessments, 189
- Exchange rates, 99
- Existence value, 19, 133. *See also* Non-utilitarian values
- Extent of ecosystems, 12, 159–161
 actual versus potential, 159
 modern transportation's effect on, 159
 varying boundaries of, 160
- Externalities as consequences of decision-making, 16–17
- F**
- Fire frequency, 117
- Fisheries Centre of the University of British Columbia, 163
- Fishery degradation, 4, 6, 28, 30, 63–64. *See also* Mangroves
 cod fishery, collapse of, 65
 scale issues, 17–18, 117–118, 173–174
- Focus groups, 196
- Food availability and needs, 29, 56, 57, 63. *See also* Agriculture
 population levels and, 97
- Forecasting, 167. *See also* Scenario analysis
- Forests
 cultural practices related to, 200
 deforestation
 as driver of ecosystem change, 104, 106
 assessing change in value due to, 138
 economic incentives for and against, 6–7
 tradeoff with production of goods, 29
 modeling, 163–164, 172
 reporting category, 10, 54, 161
 restoration, 30
 scale issues, 173–174
 time and space scales in, 115, 117
- Framework. *See* Conceptual framework of ecosystem assessment
- Freedom and human well-being
 equitable social process and protections, 82–83
 human system modeling, need to include, 165
 human well-being and, 13
 personal choice and, 74, 75, 75
- Fresh water, 57, 57
 resource models, 163, 172
- Fuel and fuelwood, 28, 56, 57
- Future priorities and trends. *See also* Scenario analysis
 balancing with present priorities, 81–82, 139
- G**
- Game theory, 196
- Genetic resources, 57, 57
- Global drivers of ecosystem change, 90–91, 106
- Global Environmental Outlook* (UNEP), 168, 168
- Global warming. *See* Climate change
- Goods, 56. *See also* Ecosystem services
- Governmental decision-making, 185, 186
 consequences of, 94–96
 variability and, 66–69
- Grazing animals, effect of increase in, 68
- Group contingent valuation, 140
- H**
- Health
 human system modeling, need to include, 165
 human well-being and, 13, 74, 75, 77
 indirect use values and, 133
 of ecosystem, 69–70
 risks, 28. *See also* specific diseases
- Hierarchy theory, 111, 118–119, 126

- Household numbers and distribution, 98
- Human rights and intrinsic value paradigm, 143.
See also Freedom and human well-being
- Human system models, 22, 162, 164–165
integrated models, 165
- Human well-being, 12–14, 71–83. See also
Poverty and the poor
as focus of ecosystem assessment, 38, 52
balancing present and future priorities, 81–82.
See also Scenario analysis
defined, 3
dependence on ecosystems, 50
evaluation of impact on, 151
freedom and choice and, 13, 74, 75, 75. See
also Freedom and human well-being
health and, 13, 74, 75
institutions mediating use of ecosystem
services, 82–83
key components of, 73–76, 75
linkages with ecosystem services, 5, 8, 76–79,
78, 128
data problems for assessing, 156
identification of, 150, 158–159
political units as factor, 161
materials for good life and, 13, 74, 75, 75
security and, 13, 74, 75
selection of indicators for analysis, 150, 158–
159
social relations and, 13, 74, 75, 75
substitutability and, 79–81
- I
- Indicator-based assessments, 188, 189, 190
- Indicator selection, 150, 158–159, 191
global scenario projects, 171
- Indirect use values, 133
- Inertia in human and ecosystems, 14, 117–118
- Inland water reporting category, 10, 54
- Inspiration, 57, 58
- Institutional fit and interplay in choice of scale,
124
- Institutions
mediating use of ecosystem services, 82–83
sociopolitical decision-making by, 7, 100
- Integrated models, 165
- Integration across scales, 126
- Intergovernmental Panel on Climate Change
(IPCC), 42, 46, 89
- data collection guidelines, 157
- handling uncertainty, 175
- science assessments, 189
Special Report on Emissions Scenarios, 168, 168
- International Geosphere-Biosphere Programme,
159
- International Monetary Fund, 99
- International Society for Ecosystem Health
(ISEH), 69
- International trade
as driver of ecosystem change, 99
consequences of decision-making by trading
communities, 94
- International transfer of technologies and
investments, 119
- International treaties, 185
- Interventions and decision-making, 7, 11–12,
23–25, 41–42, 47–48, 178–195
challenges for, 179–180
decentralized sociopolitical trends, 100
decision analytical frameworks (DAFs) and
tools, 24, 195–200, 196
decision-making processes, 180–183
deliberation, defined, 193
ecosystem change and local decision-making
process, 91–94, 92
externalities as consequences of, 16–17
knowledge's role in, 187–193
addressing users' concerns, 191
assembling accounts and assessments, 188,
189
forms of information, 191–192
interactive process, 187–188, 188
local decision-making, 183, 187
measurement and, 25, 187–188, 188
national-level decision-making, 185, 186
precautionary principle, 194
response options and strategic interventions, 3,
183–187
risk and uncertainty, dealing with, 24, 193–
195, 198
thresholds of irreversibility and, 24, 120
treaties and conventions, 185
types of interventions, 183
valuation of ecosystem services as factor, 6,
186–187
- Intrinsic value paradigm, 6, 19, 140–146
- IPAT formulation for change
(Impacts=Population x Affluence x
Technology), 88

- IPCC. *See* Intergovernmental Panel on Climate Change
- Irreversibility, thresholds of, 24, 120
- ISEH (International Society for Ecosystem Health), 69
- Island reporting category, 11, 55
- K**
- Kant's approach to value, 142–143, 144
- Knowledge
 - scientific and technological knowledge, growth in, 100–102
 - systems, 58
 - traditional or local. *See* Traditional knowledge, use of
 - types of, used in Millennium Ecosystem Assessment, 22, 44–45
 - usable knowledge, 187–193
- Kondratiev cycle related to technological change, 122
- Kuznets cycles
 - related to environmental degradation and economic growth, 105
 - related to infrastructure development, 122
- L**
- Land tenure
 - changes in, 30
 - characteristic scale of, 120
 - competition for, 106
 - economic rents and, 185
 - local ecosystems and, 81
 - types of and strategic interventions, 184
- Legal consequences and assessing metric value, 144
- Leopold, Aldo, 143
- Life expectancy, 98
- Lindeman, Raymond, 50
- Livelihood sustainability, 76–77
- Local communities. *See also* Regional and local interactions
 - assessment of, 111
 - decision-making by, 183, 187
 - drivers for change and, 89, 91–94, 92
 - effect on regional level, 94–95
 - empowerment of, 100
 - multiscale approach and, 43–44, 46
 - scale considerations and, 111, 120
 - substitutability and, 80
- M**
- MA. *See* Millennium Ecosystem Assessment
- Malaria, 28
- Mangroves
 - determining ecological boundaries associated with, 160–161
 - removal, consequences of, 77, 79, 82
- Marine ecosystems
 - modeling, 163
 - reporting category, 10, 54
 - resource models, 163
- Metadata, 153–154
- Microorganisms, 50
- Migration, effect on population distribution, 98
- Millennium Development Goals (UN), 2, 32–33, 33
- Millennium Ecosystem Assessment (MA)
 - creation and purpose of, 2, 27, 34
 - design of, 35, 36. *See also* Conceptual framework of ecosystem assessment
 - environmental impact assessment (EIA) compared to, 42
 - pressure-state-impact response (PSIR) compared, 42
 - Working Groups, 43. *See also specific Working Groups*
- Minimum levels of ecological stock. *See* Security
- Modeling, 21–22, 162–165
 - biogeochemistry models, 163
 - climate models, 164
 - computable general equilibrium (CGE), 165
 - environmental system models, 21–22, 162–164
 - for scenario analysis, 171–173
 - household, 165
 - human system models, 22, 162, 164–165
 - integrated models, 165
 - marine, 163
 - multiscale assessment and, 172
 - scenario analysis and, 167
 - sectoral, 165
 - terrestrial ecosystems, 163–164
- Monitoring and evaluation, 25, 187, 188, 190
- Mountain reporting category, 11, 55
- Multiscale assessment, 3, 39–40, 43–44, 107–126.
 - See also* Scale issues
 - arguments for, 111–112, 112

- choice of appropriate scales, resolutions, and boundaries, 124–126
 - cross-scale interactions, 17–19, 110–111, 124
 - guidance for, 124–126
 - integration across scales, 126
 - of integrated human-ecosystem interactions, 111
 - scenario modeling and, 172
 - strategic cyclical scaling, 126
 - sub-global components, 39–40, 40
- N**
- Natural capital, determination of, 28–29
 - Natural drivers of ecosystem change, 16, 103–104
 - Nested hierarchies, 119
 - Network-related concepts, 119
 - NGOs and decision-making, 100, 186
 - Non-utilitarian values, 19, 20, 128, 133, 139–146
 - Nonnative species, introduction of, 104, 161
 - Nutrient cycling, 57
- O**
- Observation scale, 108, 109
 - Odum, Eugene, 50
 - Option values, 133
 - Organisation for Economic Co-operation and Development (OECD)
 - Driver-Pressure-State-Impact Response (DPSIR), 89
 - Organisms, 50
 - Ornamental resources, 57
 - Overarching issues, 35, 36, 173–177
 - scale issues, 173–174
 - Ozone Assessment, 42, 46
- P**
- Passive use value, 133
 - Peer-review, 174
 - Pilot Analysis of Global Ecosystems, 64
 - Polar reporting category, 11, 55
 - Policy exercises, 196
 - Political units as analytical factor, 161
 - Politics of scale, 19, 122–124
 - Pollination, 57, 58
 - Population fluctuations
 - as driver of ecosystem change, 16, 91, 96–98
 - as factor of consumption change, 88
 - Portfolio theory, 196
 - Poverty and the poor, 12–14, 31–32
 - adverse ecosystem change and, 73
 - as deprivation of human well-being, 74
 - biodiversity's importance to, 77
 - defined, 74
 - dependence on ecosystem, 4, 6, 97
 - freedoms to allow self-determination by, 73
 - ill-being, dimensions of, 75
 - linkages to reduce, 79
 - social and personal factors determining, 74
 - Precautionary principle, 194
 - Predictability
 - effect of increasing, 68–69
 - scale, relation to, 110
 - Pressure-state-impact response (PSIR)
 - compared to Millennium Ecosystem Assessment, 42
 - Driver-Pressure-State-Impact Response (DPSIR), 89
 - Primary production, 57
 - Private sector's interests
 - consequences of decision-making, 94
 - decision-making by codes and policies, 186
 - in improved ecosystems, 34
 - Productive base of society, 28–29, 29
 - Property tenure. *See* Land tenure
 - Provisioning services, 8, 56–57, 57
 - sustainable use and, 62, 63–64
 - valuation related to, 133
 - PSIR. *See* Pressure-state-impact response
 - Public finance theory, 196
 - Purpose of ecosystems, 27
- Q**
- Quality assurance of data, 157–158
- R**
- Ramsar Convention on Wetlands, 2, 46
 - Real property tenure. *See* Land tenure
 - Recreation and ecotourism, 7, 57, 59
 - human well-being and, 77
 - nonconsumptive use of ecosystem services, 133
 - Regime shifts, 68

- Regional and local interactions, 94
 global scenario projects and, 171, 172
- Regional development banks, 99
- Regulating services, 57, 57–58
 as response option, 185
 biodiversity and, 77
 sustainable use and, 64
 valuation related to, 133
- Religious values, 57, 58, 139–146
 as drivers of ecosystem change, 16, 102–103
 as protectors of ecosystems, 6, 199
 human well-being and, 77
 intrinsic value paradigm, 19, 140–143
- Reports and reporting units, 159–162. *See also*
specific Working Groups
 data for, 153
 reporting categories, 10–11, 54–55
 State of the Environment reports, 195
- Resilience
 choice of scale related to, 117, 118, 123
 sustainable use and, 68
- Resilience Alliance, 126
- Responses, evaluation of, 151
- Responses Working Group, 43, 152
- Restoration of ecosystems, 30
- Review Board, 174
- Rio Declaration (1992) precautionary principle,
 194
- Risk assessment, 24, 193–195
- Rural vs. urban areas, 4
- S**
- Scale issues, 107–126, 173–174. *See also*
 Multiscale assessment
 analytical approaches and, 151–152, 160, 173–
 174
 changing scales, 112–114
 characteristic scales in time and space, 115, 116
 choice of time scales, 18–19, 123
 commonly used institutional levels and
 ecological scales, 120, 121
 conversion to common metric, 113–114, 115
 cross-scale interactions, 17–19, 110–111, 124
 defined, 108–110
 downscaling, 114, 115, 121
 hierarchy theory and, 111, 118–119, 126
 importance of, 110–112
 in ecological and human systems, 17–19, 119–
 122
 inertia in human and ecosystems, 14, 117–118
 institutional fit and interplay, 124
 level, defined, 108
 non-scalable variables, 113
 observation scale, 108, 109
 extent, 108
 grain, 108
 resolution, 108
 phenomenon, scale of, 108
 grain, 108
 politics of, 19, 122–124
 relation to variability and predictability, 110
 scale-dependent variables, 113
 scale-independent variables, 112
 “scale of observation” vs. “scale of the
 phenomenon,” 108
 socioeconomic time scales, 18, 120
 space and time domains (scale domain of the
 process), 17, 114–117
 space for time substitution, 117
 strategic cyclical scaling, 126
 upscaling, 114, 115, 120
 usable knowledge and, 191
 viewing in context, 118–119
- Scenario analysis, 22–23, 151, 152, 166–173
 background of, 167–168
 exploratory versus anticipatory, 168
 forecasting, 167
 global projects, 168, 168, 170–171, 171
 intergenerational considerations, 7, 139
 MA approach to, 169–171
 matching with previous scenario exercises, 171,
 172
 qualitative versus quantitative, 168–169
 types of, 167–169
 zero-order storylines derived from previous
 global scenario exercises, 170, 171
- Scenarios Working Group, 43, 152, 166
 objectives of, 169–170
- Science assessments, 188, 189
- Scientific drivers of ecosystem change, 100–102
- Sea level, global rise in, 104
 time scale and, 118
- Security
 human system modeling, need to include, 165
 human well-being and, 13, 74, 75, 75, 83

- Sense of place, 57, 59
- Simulation-gaming, 196
- Social relations, 59
 - human well-being and, 13, 74, 75, 75
 - space-time domains in, 117
- Sociocultural perspective. *See* Cultural values
- Socioeconomics
 - decision-making and, 197, 198
 - time scales, 18, 120
- Sociopolitical drivers of ecosystem change, 16, 99–100
- Soil formation, 57
- Spatial assessments, 188, 189. *See also* Scale issues
- Special Report on Emissions Scenarios* (IPCC), 168, 168
- Species. *See also* Endangered species
 - effect of losses of, 61–62
 - popular species and bias in collection of data, 155
- Spiritual values. *See* Religious values
- Stability in ecosystem services, 67. *See also* Variability
- State of the Environment reports, 195
- Stem-cell research, 145
- Storm protection, 58
- Strategic cyclical scaling, 126
- Strategies for response. *See* Interventions and decision-making
- Sub-global Working Group, 43
- Substitutability, 14, 79–81
 - of ecosystem services, 70
 - of species, 61–62
- Supporting services, 8, 57, 59–60
 - human well-being and, 77
 - sustainable use and, 66
 - valuation related to, 133
- Sustainable development, 2, 4, 14, 62–70
 - conferences, initiatives, and reports showing commitment to, 31, 32–33
 - cultural services and, 65–66
 - defined, 63, 81
 - health of ecosystem and, 69–70
 - livelihood sustainability, 76–77
 - provisioning services and, 62, 63–64
 - regulating services and, 64
 - supporting services and, 66
 - variability, resilience, and thresholds in services, 66–69, 67
- T**
- Tansley, Arthur, 50, 51
- Technological drivers of ecosystem change, 16, 100–102
- Terrestrial carbon balance, 113
- Terrestrial ecosystem resource models, 163–164
- Timber. *See* Forests
- Time. *See* Scale issues
- Total economic value (TEV), 132–134
- Trade. *See* International trade
- Trade-offs, determinations of, 2, 4, 89, 90, 132, 179–180
 - scenario analysis and, 167
- Traditional knowledge, use of, 22, 156–157, 174, 192, 200
- Transpiration, 113
- Transportation's effect on determining boundaries of ecosystems, 161
- Treaties, 185
- Tree hugger movement, 119
- Tropics and population growth, 97
- Tropospheric ozone, 120
- U**
- Uncertainty
 - assessing and communicating about, 23, 151, 175–177
 - decision-making and, 24, 193–195, 198
- United Nations
 - drivers of ecosystem change and, 7, 90
 - Environmental Programme's *Global Environmental Outlook*, 168, 168
 - Millennium Development Goals, 2, 32–33, 33
- Unpublished information, use and validation of, 22, 156–157, 174, 192
- Urban areas
 - growth, 97
 - reporting category, 11, 55
 - rural vs., 4
- U.S. Census Bureau projections of world population, 96
- Utilitarianism, 19, 130, 142. *See also* Valuation of ecosystems
- V**
- Valuation of ecosystems, 19–20, 21, 41, 127–147
 - actual behavior used as basis for, 135

- benefits transfer, 135–136
- cultural values. *See* Cultural values
- decision-making taking into account, 186–187
- economic valuation methods, 132, 134–136, 135
- assessment of change in value, 137–139, 138
 - intergenerational considerations, 7, 139
 - motivations for, 130–132
 - putting into practice, 136–139
 - total economic value (TEV), 132–134
 - utilitarian approach, 19, 20, 130, 142
- group contingent valuation (CV), 140
- hypothetical behavior used as basis for, 135
- interactions of political and market metrics, 143–146
- intrinsic value paradigm, 6, 19, 140–146
- Kant's approach to value, 142–143, 144
- non-use values, 19, 128, 133, 139–146
- paradigms of value, 128–139
- safe minimum standard (SMS), 146
- sociocultural perspective, 128–129, 140
- sustainable use and, 62–63
- use values, 132–133
- welfare economics and, 134
- Variability
- governmental and individual buffering against, 66–69, 67
 - scale, relation to, 110
- W**
- Water. *See also* Water quality
- inland water reporting category, 10, 54
 - regulation, 57, 58, 77
 - shortage, 79
- Water quality, 57, 58, 104. *See also* Fresh water
- indirect use values and, 133
 - substitutions for, 14
 - tradeoff with production of goods, 29
 - U.S., 28
- Well-being. *See* Human well-being
- Wetlands
- intrinsic value of, 144, 145
 - reporting category for, 10
- Women's status, 100
- Working Groups, 43, 152
- World Bank, 99
- World Business Council on Sustainable Development (WBCSD), 168, 168
- World Commission on Environment and Development, 81
- World Summit on Sustainable Development (WSSD), 168
- World Trade Organization, 99
- World Water Commission's *World Water Vision Scenarios*, 168, 168
- World Wide Fund for Nature, 160
- Z**
- Zoning regulation, 95