

Index

- acid rain 49, 99, 139, 188, 321
- ALBA 90
- Anthropocene era 33–6, 71
- Arndt, H.W. 5, 13, 16–7, 19–21

- Babe, R.E. 57, 71–2
- Barnett, H.J. 103–4, 132
- Base Case scenario 283–95, 299–302, 331
- Baumol, W.J. 42, 61, 64, 297
- Beckerman, W. 18, 102, 120
- benefit–cost analysis 81–4, 92
- Beveridge, W.H.B. 13, 244
- biodiversity loss 33, 76, 84, 156–67, 172
- biophysical limits 100, 132, 168, 181, 208, 216, 242, 269, 276, 320, 339
- biosphere
 - burden economies place on 26, 44, 181, 269, 274, 298
 - and economic cycle 95–100
 - human alterations to productivity of 34–6, 175
 - use as sink 138–55, 265–6
- black growth 205–6
- brown capital 285, 287, 332
- brown economy 1, 181–2, 287, 302
- brown growth 205–7, 264–5
- brown investment 274, 276, 284, 287, 331–3
- Brundtland report 22–3, 306
- business-as-usual 193, 274–5, 331, 340
 - see also* Base Case scenario

- Cambridge capital controversy 80–81
- Canada
 - appetite for information about economy 4
 - cap and trade programs 68
 - CFCs 142
 - as characterized by exploitation of natural resources 54
 - on climate change 24, 144, 268
- economic growth
 - average rates of 32–3
 - and CO₂ intensity 204
 - as insufficient for solving problems 268, 305–6
- economic scenarios 282–96, 301–2
- environmental indicators 266–7
- environmental performance ranking 267–8
- environmental policy 320–24
- expenditures on goods as percentage of GDP 192
- fertility rates 308
- full employment
 - and average hours employed 248–9
 - commitment to 13
 - government on 244
- GDP per capita and ecological footprint 179–80
- GDP percentage change, population and environmental indicators 266–7
- GDP percentage from expenditure on services 191
- GHG emissions 155, 189–90, 267–8, 284–5, 289, 302–3, 314, 321–2
- goods as percentage of exports and imports 192–3
- government
 - on full employment 244
 - understanding of sustainable development 23–5
 - views and policies on population 308–10
- green bonds 333
- growth as prime policy objective 30
- households
 - below LIM 253–4

- mean and median net wealth 260
- wealth ownership 260–61
- immigration and population 308–17
- income inequality 256–7, 259
- intact forest landscapes 158
- international trade 337
- legislated limits on private medicine 54
- LICOs 254–6
- LIM
 - after taxes and transfers 252–3
 - households below 253–4
- monetarism 14
- net replacement rate 249–50
- nuclear waste management 153–5
- oil 87, 105, 121, 158
- population
 - and immigration 308–17
 - indicators 266–7
 - poverty 251–6, 324–7
 - reduced work time 328–9
 - technology assessment 336
 - unemployment rates 244–7, 249
 - use of taxes 332
 - wealth distribution 262–3, 339
- Canada's Ecofiscal Commission 284, 340
- cap and trade programs 68, 75, 285, 303, 321, 323, 331
- capital
 - concept of 79–81
 - green 277, 279–80, 285–6, 332–3
 - human-made 79, 90
 - and labor 47–8, 242, 257–9, 299–300, 305, 334, 336–7
 - produced 81, 85–9, 157, 170
 - see also* natural capital
- capitalism 296–301
- carbon budget 39, 128, 151, 167, 305
- carbon dioxide (CO₂)
 - carbon budget 128, 151, 167
 - case of 197–202
 - economic growth and energy 202–5, 208
 - in energy–emissions trap 130
 - global warming potential 167
 - humans raising levels in oceans 163
 - intensity 202–5, 208, 320–21
 - length of time in atmosphere 151
 - in planetary boundaries illustration 137–8
- carbon, making room for 197–202
- carbon price 68–9, 284–5, 290, 303, 331
- carbon taxes 67–9
- central banks 14
- CFCs (chlorofluorocarbons) 140–42
- 'circular economy' 47
- climate change
 - causes 39, 105, 128, 142, 146, 148
 - consequences 101, 146–8
 - deliberations on avoiding catastrophe 151–2, 197–8, 201
 - future global emission level predictions 149–51
 - as human-induced impact 20, 144, 146, 148
 - identification of 142–3, 203
 - implications for oceans 164
 - occurrence 145, 148
 - in planetary boundaries 137–8
 - positives and negatives in politics and science 143–4, 148–51, 306–7
 - predictions of average global temperatures 145, 148
 - threshold 84, 137
 - UN Framework Convention on 203
 - world slow to act upon 143–4
- closed systems 45–6, 48, 74, 304
- coal 46, 62, 102–3, 108, 117–8, 122, 125, 195–6, 202
- 'cogeneration' system 47
- Cold War 9, 16
- colonialism 242
- colors of growth 205–7
- commodification 53–4
- composition
 - of GDP and environmental impact 184, 188–93, 207–8, 305
 - relation with scale and technology 28–9, 47, 186–97
- consumables and durables 223, 225, 228–35, 239–40
- consumption
 - competing through 236
 - conspicuous 219–21
 - and economic growth 213–14
 - policy 337–9
 - of positional goods 220

- public goods as non-rival in 220–21
- and status 221–2, 235–7, 239–40
- and utility 212–3, 225–7, 236
- Costa Rica 160
- creative destruction 50–51
- critical materials 112–6, 135, 167

- Daly, H.E. 18, 30, 43–4, 87–8, 123, 213, 241, 297, 318–20, 324, 335, 337
- decision-making 25, 69, 83–5, 91–2
- decoupling
 - absolute 38, 108–12, 175–6, 189, 266–7, 319
 - economic growth
 - from environment 26–7, 36–40, 187–9, 207–8
 - from materials and energy 107–12, 132, 135, 210
 - of GDP from happiness 210
 - principle of 27
 - relation of flows to GDP 38–9, 44
 - relative 38, 108–11, 175–6, 184, 279
 - smart prosperity achieved through 56
- deforestation 84, 158–62, 175, 199
- degrowth 12, 13, 205, 206, 271
- disappointments of economic growth
 - environment 264–8
 - full employment 244–50
 - globalization and colonialism 242
 - income inequality 256–9
 - indications of 242–3
 - poverty 250–56
 - social and environmental costs 241–2
 - summary 268–9, 305–6
 - wealth inequality 260–63
- discounting 70–72, 79, 83
- divestment movement 64
- Domar, E. 15–7
- dual role of prices 65–9
- durables *see* consumables and durables
- dynamic efficiency 69

- Earth system 34–5, 136, 138, 173–4
- Easterlin, R. 212–3, 237, 241
- ecological footprint 48, 73, 176–81, 318
- ecological macroeconomic model *see* LowGrow SFC model
- ecological modernization 27–8
- ecological thresholds 84, 93, 136–7

- economic cycle 95–100
- economic growth
 - and carbon 197–202
 - colors of 205–7
 - as of continuing paramount importance 21–2
 - critiques by economists 18–21
 - damaging social structures 52
 - decoupling
 - from environment 26–7, 36–40, 187–9, 207–8
 - from materials and energy 107–12, 132, 135, 210
 - definition
 - conventional 44–5
 - difficulty finding 42–3
 - energy and carbon dioxide 202–5
 - and full employment 14–8, 244–50, 305–6
 - GDP as measure of 4, 17, 30
 - and green growth 27–8
 - and happiness 209–16, 238
 - and HappyGrow 223–5
 - Harrod–Domar model of 15–16
 - historical relation to progress 5, 7–8
 - history of idea of 4–5
 - vs long term viability of
 - environment 339–40
 - as overarching policy objective 17, 197, 304
 - and positional goods 222
 - as progress 9–12, 339
 - question of longevity 55
 - stressing nature's capacity beyond limits 93
 - and sustainable development 22–7
 - and welfare 216–17, 220
 - see also* disappointments of economic growth
- economies as open systems 44–50, 55, 74, 95–6, 138, 317
- ecosystem goods and services
 - as 'anathema' 90
 - in distress 156–67
 - loss of 167, 307
 - nature of 49, 79
 - trade off 78
 - valuation of 77–8, 83–5, 87, 90–93
 - willingness to pay for 82–3
 - see also* services

- ecosystems
 - demands increasing pressure on 156–8, 164–5, 175
 - disrupted 105
 - and ecological thresholds 84, 136–7
 - marine 164
 - as open systems 45
 - phases describing 50
- Ehrlich–Simon bet 106–7
- elasticity of substitution 258–9, 269–70
- electricity
 - benefit–cost analysis 83–4
 - generation 62, 97, 117–18, 122, 124, 202, 278–9, 284–5
 - in LowGrow SFC illustration 277
 - in LowGrow SFC scenarios 278–9, 284–5, 290–91, 322, 331
 - as most versatile and convenient form of energy available 155
 - and nuclear energy 118, 122, 152–5, 193
 - and rebound effect 196–7
 - second law of thermodynamics applied to 46–7
 - technological advances involving 196
 - use of 117–18
- emissions trading 54, 68, 76, 284–5, 321–4
- employment 327–30, 334, 337
 - see also* full employment; unemployment
- energy
 - age of fossil fuels 117–18
 - carbon dioxide and economic growth 202–5
 - coal 39, 40, 46, 62, 103, 117, 118, 121, 122, 125, 129, 195, 202
 - consumption 38–9, 48, 122, 267, 298
 - decoupling economic growth from 107–8, 132, 135, 210
 - economies depending on nature for 52
 - EROI 126–30, 287
 - in first law of thermodynamics 46
 - flows 39, 43–5, 47, 49–50, 74, 95–6, 99–100, 190, 192, 274, 304, 318–19, 334
 - gas 39, 40, 46, 117, 118, 121, 122, 125, 126–7, 129, 132
 - geothermal 40, 46, 122
 - in global economy 47–9
 - hydro 46, 83, 117, 122, 127, 128, 197, 333
 - inability to be reused or recycled 117
 - intensities 55, 108, 199, 202, 204–5, 208
 - nuclear 118, 122, 127, 128, 133, 153
 - oil 39, 40, 46, 63, 103, 117, 118, 122, 125, 126–7, 129, 132, 197
 - peak oil 47, 102, 118–22, 167
 - planning vs determinism 130–32
 - primary use 34–5
 - in second law of thermodynamics 46–7, 117
 - solar 40, 45–6, 48, 97, 117, 122–4, 126, 127–8, 178, 290
 - sources of 45–6, 62–3, 131
 - wind 40, 46, 88, 97, 122–4, 126, 127–8, 290
- ‘energy balance’ principle 46
- energy–emissions trap 127–30, 305–6
- energy transition 122–7, 132–3
- Enlightenment era 4–8, 100–101
- entropy 18, 298
- Environmental Burden Index (EBI) 277–83, 288–90
- environmental impact
 - and changes in technology 193–7
 - and composition of GDP 188–93
 - decoupling economic growth from 26–7, 36–40, 187–9, 207–8
- environmental influences 288–91
- environmental Kuznets curve 264–6
- environmental management principles 318–20
- Environmental Performance Index 73, 243, 280
- environmental policy
 - as different from other policy dimensions 317–18
 - environmental management principles 318–20
 - for limiting throughput 320–24
- environmental record 265–8
- environmental risk 116, 122
- environmentalism 19, 306, 318
- equal access to technology and resources 60

- EROI (energy return on energy invested) 126–30, 287
 exclusion 66–7
- fair trade movement 64, 338
- fallacy of composition 83, 89
- Farley, J.C. 84, 87–8, 123, 318–20
- feedbacks 57, 74, 168–70, 172–4, 272
- financial influences 292–6
- flows
 of benefits from nature 79
 capital and labor 47–8, 97
 connection with stocks 39, 168–9, 270, 272, 284
 ecological biomass 175
 in ecological footprint 177
 energy and materials 43–5, 49–50, 74, 95–6, 99–100, 190, 192, 274, 304, 318–19, 334
 excessive 39
 goods and services 85, 97
 money 70, 97, 272–3
 waste 27, 36, 38–9, 43, 45, 99
- forests 157–62
- fossil fuels
 and acid rain 99
 age of 117
 carbon dioxide emissions from 139, 177–8, 202
 as coal, oil and natural gas 46
 and energy planning 130–32
 EROI 128–30
 global materials extraction 97–8, 108–10, 266
 means of dealing with 178
 as non-renewable resource 39
 potential for electricity to replace 118
 prices of 106
 role of cheap energy from 133
 transitioning from 40, 87, 122–7, 132, 305, 307
 undesirable characteristics 127
 use in Canada 285
- fracking 20, 119, 121
- freedom of entry and exit 60
- fresh water 166–7
- Friedman, B.M. 171–3, 242
- Friedman, M. 14
- full employment
 and economic growth 14–18, 244–50, 305–6
 hours employed and 248–9
 Keynesianism and GDP 12–14
 see also employment
- fund-service resources 87–8, 123–4, 157
- future incomes 69–70
- Galbraith, J.K. 18, 220
- GDP
 access to information and 67
 as built from data on market prices and quantities 76
 Canadian immigration 317
 Canadian scenarios 281–3, 286–96
 carbon and emission prices affecting 68–9
 colors of growth 205–7
 commodification raising 53–4
 composition of 184
 decoupling examples 36–40, 108–9, 208
 deficiencies as measure of well-being 180
 defined and measured 9
 disappointments of economic growth 243
 ecological footprints 179–80
 environmental impact and composition of 188–93, 198
 environmental Kuznets curve 264–6
 EROI 127–9
 vs GDP per capita 31
 Genuine Progress Indicator 216–19
 global HANPP 175–6
 global socio-economic trends 34–5
 green growth 27
 green investment 274–5
 happiness 210–16
 in IPAT 186–8
 labor productivity 334
 major economies comparison 247–9, 255–6, 266–7
 materials footprint 111–12
 as measure of economic growth 4, 17, 30, 42–5, 55, 319–20
 as measure of progress 9–12, 71, 73–4
 misinformation 60, 63, 74, 76
 performance indicators 277–9

- reduced work time 327
- relating to carbon dioxide,
 - population and energy 198–202, 208
- in steady-state economy 297
- total utility 225, 228, 230–34, 237, 240
- unemployment as problem of
 - inadequate 12
- genetically modified organisms (GMOs) 87, 140, 193
- Genuine Progress Indicator (GPI) 73, 209, 216–19, 230
- ‘get the prices right’ 72
- GHG *see* greenhouse gas (GHG)
 - emissions
- Gini coefficient
 - of distribution of pre-tax incomes 291, 303
 - of income inequality 256–7, 259, 282
 - as measure of distribution 10, 218
- global earth-system trends 35
- global economy
 - ability to transition to renewable sources of energy 128
 - ecological footprint of 178
 - major recession 119
 - as open system 47–8
 - requiring more materials per unit of GDP 98, 109
 - surpassing environmental thresholds 136
- global HANPP 175–6
- global socio-economic trends 34–5
- global warming potential (GWP) 167
- globalization 242, 246
- Godley, W. 272, 273
- Going for Growth initiative 22, 304
- goods and services
 - in advanced economies 191
 - basket measure 254
 - bought for status 221, 223
 - bought for usefulness 226
 - in commodification of nature 53–4
 - in composition definition 28
 - diminishing provision of ecological 105
 - in economic cycle 96–7, 99
 - effect of increasing 241
 - and employment 15, 244
 - environmental impacts of 190
 - exclusionary 338
 - in GDP definition 38
 - and green investment 274–5, 286
 - implication of prices 62, 65, 68–9, 71
 - in IPAT equation 188
 - in managing without growth 45–7
 - as measure of GDP 9–10, 58
 - monetary valuation 77–80, 85, 90–91, 93
 - as public goods 220
 - relation to sustainable prosperity 282
 - and rising consumption levels 220
 - rival, for markets 66
 - and technology 187, 198
 - utility-yielding 104
 - see also* ecosystem goods and services; services
- Gordon, R.J. 31, 32, 186
- GPI *see* Genuine Progress Indicator (GPI)
- Great Acceleration 34–6, 97–8
- green capital 277, 279–80, 285–6, 332–3
- green economy 1, 90, 181–2, 287, 302
- green growth
 - and economic growth 27–8, 36
 - in environmental Kuznets curve 265–6
 - essence of 36
 - false hope of 3
 - and other colors of growth 205–7
 - with respect to climate change 128
 - version of 289
- green investment 274–7
 - additional 275–7
 - non-additional 275–7, 285
 - non-productive/unproductive 274, 275–6, 285–6, 298, 331, 333
 - productive 274, 275–6, 285–6, 332–3
- greenhouse gas (GHG) emissions
 - benefits of reductions 278–80
 - Canada generating highest levels 314
 - cap and trade system for 68, 285, 321, 323
 - decoupling example 36–40
 - effect of INDCs 149–51
 - impact of international trade 189–90
 - intensity and colors of economic growth 206–7
 - length of time in atmosphere 151

- and nuclear generating stations 155
- percentage change in OECD
 - countries 266–8
- reduction scenario 284–95, 299–302, 322, 331
- relation to Environmental Burden Index 278–80, 289
- system dynamics model 128–30
- growth
 - capitalism without 296–301
 - consumption and status 221–2
 - definitions 8, 42
 - distinction with development 8, 43
 - proliferation of different kinds of 243
 - quantitative 43, 55
 - slower 31–3, 37, 39–40, 44, 287
 - see also* economic growth; green growth; limits to growth; managing without growth
 - ‘growth imperative’ 296–7
 - growth paradigm 17, 19
- HANPP (human appropriation of net primary production) 94, 174–7, 181, 318
- happiness
 - and consumption of goods 219–21
 - and economic growth 209–16, 238
 - Genuine Progress Indicator (GPI) 216–19
 - measurement of 238
 - shopping simulation model 222–37
 - status, consumption and growth 221–2
- Happy Planet Index 73
- HappyGrow
 - components 223–4
 - consumption and utility in 225–7
 - equations used in 239–40
 - explanation 223–5
 - purpose 223
 - and real world 235–7
 - scenarios
 - mixed 234–5
 - people as same 228–30
 - public good 233–4
 - rich and poor 230–31
 - use and status 232–3
- Harrod–Domar model 15–16
- health
 - access to health care 54, 250, 326
 - basket of goods for 254
 - benefits from reductions in GHG emissions 278
 - Canadian government views and policies 309
 - cost concerns 218, 243
 - and drought 166–7
 - effects of lead poisoning 141
 - and genetically modified organisms 140
 - link to poverty 324
 - materials and energy discharges 319
 - obesity 101–2
 - relation to income inequality 259
 - as sensitive to climate change 146–7
 - and supply distortion 116
- homogeneity of products 60
- human appropriation of net primary production (HANPP) 94, 174–7, 181, 318
- Human Development Index (HDI) 73, 180–81
- human-induced impacts
 - acceleration of 167, 318
 - in Anthropocene era 33–6
 - assessments of 156–7, 173
 - climate change 20, 144, 146, 148
 - composition 184
 - disturbing exchange of energy 45–6
 - and ecological footprint 178–9
 - extinctions 195
 - information on 73
 - limited progress in reducing 265–6
 - mammal populations 158–9
 - marginal 84
 - material flows 112
 - oceans 163–4
 - scale of 138, 183–4
 - technologies employed 185–6
 - time span 20
- human-made capital 79, 90; *see also* produced capital
- human system 50, 173–4
- immigration 310–17
- income distribution 71–2, 218–19, 250, 256–9, 305, 325

- income inequality
 and economic growth 256–9
 in environmental Kuznets curve 264
 increased transfer payments to
 reduce 284, 286
 as increasing 257–8, 306–7, 330
 and poverty 252, 324–7
- INDCs (indicated nationally
 determined contributions) 149–50,
 152
- inequality
 income 256–9
 and poverty 324–7
 wealth 260–63
- inequality-adjusted human
 development index (IHDI)
 180–81
- information
 other sources of 72–3
 and prices 57–63, 69–74
 and systems 57, 74
 and theft 66–7
 and theory of second best 64–5
- insects, loss of 159–60
- intact forest landscape (IFL) 158
- integrated assessment models (IAMs)
 173
- intensity
 carbon dioxide 202–5, 208, 320–21
 in colors of growth 205–7
 emissions 36–8, 305
 energy 55, 108, 199, 202, 204–5,
 208
 in environmental Kuznets curve
 264–5
 material 55, 108–9
 and scale 205–7, 264–5
- Intergovernmental Panel on Climate
 Change (IPCC) 128, 139, 144–9,
 151, 173, 187, 197–9
- international trade 24, 110–11, 188–93,
 242, 336–7
- investment
 brown 274, 276, 284, 287, 331–3
 green 274–7, 279–80, 284–6, 289–90,
 331–3
 as important policy area 330–33
- IPAT (impact, population, affluence,
 technology)
 environmental impact
 composition of GDP and 188–93
 technology changes and 193–7
 explanation 186–8
- Jackson, T. 15, 40, 55, 171, 182, 258,
 276, 287, 295, 297, 302–3, 307
- Jevons, W.S. 102–3, 108, 132
- Katie *see* HappyGrow
- Kaya equation 198–202, 205
- Keynes, J.M. 12–15, 292
- Keynesianism 12–14
- knowledge accumulation 6, 185
- ‘knowledge based economy’ 4, 107
- Kuznets, S. 10, 264
- Kyoto Protocol 143, 149, 203, 206, 306
- labor *see* capital and labor;
 unemployment
- labor productivity 15, 31–2, 247, 287,
 291–2, 331, 333
- lags 168
- Lavoie, M. 272, 273
- laws of thermodynamics 46–7, 99–100,
 117, 266
- Layard, R. 209–11, 237, 330, 338
- lead 140–42
- LICO (low-income cut-off) 254–6, 325
- LIM (low-income measure) 252–5
- limits
 biophysical 100, 132, 168, 181, 208,
 216, 242, 269, 276, 320, 339
 quantitative 136–7, 320–24
- limits to growth
 difficulty in working through 167
 ecological footprint 176–81
 economic cycle and biosphere
 95–100
 energy 117–32
 historical concerns 100–107, 132
 human appropriation of net primary
 production 174–6
 materials 107–16
 planetary boundaries 136–8, 265
 services 156–67
 sinks 136, 138–55
 system dynamics 168–74
- Limits to Growth* 19, 169–73, 272
- Living Planet Index (LPI) 163–5, 178,
 318

- LowGrow SFC model
 carbon price in 284–5, 290, 303, 331
 compatibility with capitalism
 296–301
 conclusions 302
 overview 272–7, 306
 performance indicators 277–81
 and revenue neutrality 322
 scenarios
 Base Case 283–95, 299–302, 331
 GHG Reduction 284–95, 299–302,
 322, 331
 intention 282–3
 overview 283–6
 results 286–8
 Sustainable Prosperity 284–96,
 298–302, 331–3
 as way forward 307
- making room (carbon) 197–202
- Malthus, T. 51, 100–102, 132, 134, 170
- managing, definitions of 41–2
- managing without growth
 and capitalist economies 296, 302
 and changing patterns of ownership
 298
 contribution in advanced economies
 201
 dilemma for policy makers 306
 economic model development 271
 entailing measurement 44
 explanation 30–31
 as likely to require changes in
 economy 45, 132
 meaning of 41–4
 model for 271–7
 as old concept 40–41
 scenarios for 281–96
 use of statistics 43–4
see also policies for managing
 without growth
- ‘marginal revolution’ 102
- Market Basket Measure (MBM) 254
- Marshall, A. 78–9, 222
- Marx, K. 9, 51, 80–81, 156, 296–7,
 299
- Mason, R.S. 221–3
- materials
 consumption 48, 110–11
 critical 112–16, 135, 167
 decoupling economic growth from
 107–12, 132, 135, 210
 economies depending on nature for
 52
 flows 43–5, 47, 49–50, 74, 95–6,
 99–100, 109, 112, 190, 192, 274,
 304, 318–19, 334
 global extraction 97–8, 108–10, 266
 intensities 55, 108–9
 synthetic 49, 87, 140
- Meadows, D.H. 19, 169–72, 181,
 271–2
- metal ores 108–10
- metals 39, 96, 106, 113–16
- Mill, J.S. 51, 209–10
- minerals 112–16, 123, 157–8, 166, 195
- Mishan, E.J. 18
- misinformation 62–3
- monetarism 14
- monetary valuation
 alternatives to traditional 92
 meaning of 77–8
 problems of 84–5, 89
- Morse, C. 103–4, 132
- multi-criteria decision analysis
 (MCDA) 92
- MuSIASEM 73
- NAIRU (non-accelerating inflation
 rate of unemployment) 14, 244–5
- ‘national dividend’ 238
- national income
 accounts system 10–12
 effect on economic growth on 258
 shares of capital and labor in
 299–300
- natural capital
 critical 88–9
 definition 78–9
 as inadequate conceptualization of
 nature 87–9
 as instrumental approach to nature
 89–91
 problems of 80–81
 reasons for appeal of 79–80, 92–3
 valuation methods 81–7, 93
- Natural Capital Committee (NCC)
 89–90, 93
- natural resources
 Canada’s exploitation of 54

- connection between flows and stocks 39
- depletion affecting GPI 216, 219
- expectations of future prices 19–20, 69
- global consumption of 177–8
- vs principle of infinite expansion 298
- trade offs to conserve 78
- United States historical views on 103–5
- natural systems 49, 52, 57, 139
- nature
 - ‘advancing exhaustion’ of 298
 - commodification of 53–4
 - dealing with waste 139–40
 - dominating chemical elements 112
 - economies dependent on 52, 93
 - economy, society and 52–3, 57
 - financialization of 90–91
 - human relationship to 156–7
 - impacts of over-use as sink for wastes 140–55
 - inadequate conceptualization of 87–9
 - instrumental approach to 89–91
 - irreplaceable aspects of 194–5
 - ‘man conquering’ 51
 - question of how humans interact with 58, 61, 186–7
 - see also* pricing nature
- nested systems 50, 57, 74
- ‘net energy cliff’ 126–7
- net replacement rate (NRR) 249–50
- Neumayer, E. 178, 218–19
- New Scarcity 105
- no externalities 60–61
- non-linearities 168
- non-renewable resources 19–20, 39, 105–7, 268–9, 319
- Norgaard, R.B. 106–7
- nuclear energy 117–18, 122, 128, 133, 153
- Nuclear Waste Management Organization (NWMO) 153–4
- nuclear wastes 152–5
- obesity 101–2, 243, 309
- oceans 162–6
- OECD
 - cautionary assessment of data 267
 - collation of information 266
 - definition of full employment 244
 - economic growth 21–2, 304
 - Going for Growth initiative 304
 - green growth 27–8
 - income inequality trends 257
 - measuring wellbeing 219
 - natural capital 85
- OECD countries
 - critical materials 112–16
 - environmental performance 266–8
 - household wealth ownership 260–61
 - income inequality 257
 - limits to growth 243
 - material footprint 111, 266
 - poverty 251–3
 - unemployment 244–6, 249–50
 - wealth distribution 261
 - working time 328, 330
- oil
 - benefits of 118
 - concerns about limits to growth 132
 - EROI 126–7
 - fossil fuel energy surpassed by 117
 - global demand for 125
 - global production of 120–21
 - limited supplies of 122
 - possibility of industry decline 40
 - prices 14, 20, 133, 204, 306
 - renewable alternatives 123
 - sands 87, 105, 121, 132–3, 158
 - transition away from 122
 - unconventional 20, 120–22, 132–3
- Old Scarcity 105
- open systems
 - analysis of 50–53
 - definition 45
 - demands upon environment 47
 - economies as 44–50, 55, 74, 95–6, 138, 317
 - as nested 50
- Paley Commission 103–4
- Pareto efficiency 59, 61–2, 64, 221
- Paris agreement on climate change 149–51, 204, 268
- participants, numerous 60
- Pascual, U. 78, 81, 84, 92–4
- payments for ecosystem services (PES) 160

- peak oil 47, 102, 118–22, 167
 perfect information 60
 performance indicators 277–81
 Pigou, A.C. 213, 238
 Piketty, T. 257–8, 261, 298–9
 Planet Earth as closed system 45–6, 48, 74, 304
 planetary boundaries 136–8, 265
 plastic waste 164–6
 policies for managing without growth
 compelling arguments for 339–40
 consumption 337–9
 environment 317–24
 international trade 336–7
 investment 330–33
 population 307–17
 poverty and inequality 324–7
 productivity 333–4
 reduced work time 327–30
 from simulations to reality 304–7
 technology 334–6
 Pollard, S. 5–9
 population
 Canadian 308
 government views and policies on 308–10
 immigration 310–13
 and immigration policy 313–17
 natural increases in 310
 economic growth as essential for 307–8
 percentage change in various countries 266–7
 positional goods 19, 220–22, 305, 338
 poverty
 absolute and relative 251
 aim to end 26
 in Canada 251–6, 324–7
 and climate change impacts 147
 degradation of ecosystem services 157
 and economic growth 172, 238, 241–2, 250–56, 268–9, 305–6
 extreme 101
 Galbraith on 18
 and income distribution 256–7, 263, 324–5
 income measures 251–6
 and inequality 324–7
 inter-related factors 324
 Malthus' predictions of 100–101
 measures to combat 326
 unemployment as cause of 249–50, 282, 327
 prices
 and distribution of income and wealth 71–2
 carbon 68–9, 284–5, 290, 303, 331
 dual role of 65–9
 and environmental problems 74–5
 and information 57–63, 69–74
 oil 14, 20, 133, 204, 306
 relative 62
 single role for 67–9
 and theft 66–7
 and theory of second best 63–5
 and time 69–71
 pricing nature
 approaches to 76–7
 efforts as fraught with problems 305
 monetary valuation 77–8
 natural capital 78–91
 recommendations for 91–3
 valuation methods 81–7, 93
 produced capital 81, 85–9, 157, 170
 productivity policy 333–4
 'productivity trap' 15
 progress
 economic growth as 9–12, 339
 GDP as measure of 9–12, 71, 73–4
 historical relation to economic growth 5, 7–8
 idea of 5–9
 pre-Enlightenment 4
 slowing down 186
 social 4, 276, 281
 property rights 19, 51–2, 60, 66–7, 70, 79, 81–2, 105
 public goods 220–21, 223–4, 233–4, 237, 331, 338
 qualitative development 43, 55
 quantitative growth 43, 55
 quantitative limits 136–7, 320–24, 331
 rebound effect 108, 117, 196–7
 recycling
 and 'circular economy' concept 47
 in Earth system–human system 174

- eventual material and waste
 - degradation 46
 - impossibility of total 100
 - limited impacts 98
 - and risk 112, 116
- REDD+ 160–61
- reduced work time 248–9, 327–30
- renewable resources 19–20, 39, 104–5, 122–30, 132–3, 268–9, 318
- resource rents 86
- resource scarcity
 - beliefs about 107
 - Old and New 105
 - physical 113
 - and prices 19–20, 85, 105–7, 120–21, 194, 305
 - Scarcity and Growth* study 104–5
 - water 33, 54, 147, 166–7
- revenue neutrality 67–8, 322
- rivalry 65–6
- Roberto *see* HappyGrow
- Royal Society 6–7, 144
- Samuelson, P. 13
- scale
 - 11-step life evaluation 214–15
 - decisions on 318
 - of economy and green growth 205–8
 - in environmental Kuznets curve 264–5
 - of human impacts 138, 183–4
 - and intensity 205–7, 264–5
 - relation with composition and technology 28–9, 47, 186–97
 - result of increases in 196–7
- scarcity *see* resource scarcity
- Schumpeter, J.A. 50–51
- second-best theorem 63–5, 77
- Sers, M. 128, 130, 134
- services
 - forests 157–62
 - fresh water 166–7
 - oceans 162–6
 - reports on 156–7
- shopping simulation model *see* HappyGrow
- Simon, J. 106–7, 185
- sinks
 - climate change 142–52
 - lead and CFCs 140–42
 - limited capacity 139–40, 266
 - nature of 138–9
 - nuclear wastes 152–5
 - sixth extinction 158–60, 163, 175, 307, 339
 - slower growth 31–3, 37, 39–40, 44, 287
 - Smith, A. 8, 17, 51, 59, 222
 - social exclusion
 - income inequality causing 282
 - link to poverty 250, 324–5
 - measures to combat 326
 - social influences 291–2
 - stagflation 14
 - status
 - consumption and growth 221–2
 - in HappyGrow model 223–37, 239–40
 - positional treadmill 213
 - as social phenomenon 237
 - status goods 220–21, 231, 235, 331, 338
 - steam engines 34, 108, 195–6
 - stock-flow consistent (SFC) modeling 272–4, 292–3, 295, 297
 - stock-flow resources 87–8, 123, 157–8
 - stocks
 - connection with flows 39, 168–9, 270, 272, 284
 - of consumables and durables 223, 228, 234–5
 - depreciating 223
 - financial 272–3, 284
 - fish 164–5, 194
 - of natural assets 79, 178
 - of natural capital 80, 86
 - stranded assets 86–7, 129
 - supply distortion 116
 - sustainable development 19, 22–5
 - sustainable development goals (SDGs) 25–7
 - Sustainable Prosperity Index (SPI)
 - calculation of 283
 - as composite performance indicator 278
 - environmental influences on 288–91
 - explanation 280–81
 - financial influences on 292–6
 - in LowGrow SFC illustration 277
 - in LowGrow SFC scenarios 288, 331
 - social influences on 291–2
 - variables in 282

- Sustainable Prosperity scenario
284–96, 298–302, 331–3
- Sweden
absolute poverty 251
average hours employed and full
employment 248–9
economic growth
average rates of 32–3
as insufficient for solving
problems 268, 305–6
environmental performance ranking
267
fertility rates 308
GDP
per capita and ecological footprint
179–80
percentage change in, population
and environmental indicators
266–7
percentage from expenditure on
goods 192
percentage from expenditure on
services 191
goods as percentage of exports and
imports 192–3
government provision of services
57–8
income inequality 256–7
LIM
after taxes and transfers 252–3
households below 253–4
net replacement rate 249–50
population 266–7, 308
unemployment rates 244–7, 249
waste management organizations
153
system dynamics 168–74
system dynamics macroeconomic
model *see* LowGrow SFC model
systems
analysis 50–53
carbon taxes and emissions trading
68–9
closed 45–6, 48, 74, 304
feedback loops 57, 74, 169, 272
functioning 57–8
of markets and prices 59, 66
nested 50, 57, 74
price 57, 71–2, 76, 170
social and environmental 59, 74
sources, sinks and services 100, 135,
167–8, 181, 186, 265
see also open systems
- taxes
carbon 67–9
differential, on goods and services
338
and distribution of income 259
emissions 322–4
gasoline 267–8
inequities in distribution ameliorated
through 91
investment 332
on luxury goods 222
markets working well through 58
policy objectives 22
used to adjust prices 74
on wealth 325–7
- technology
assessment 334–6
changes in, and environmental
impact 193–7, 305
investment and productivity 331
mitigating and preventing
environmental impacts 185–6,
208
relation with composition and scale
28–9, 47, 186–97
- theft 66–7
- theory of second best 63–5, 77
- thermodynamics, first and second laws
of 46–7, 99–100, 117, 266
- think tanks 58, 205, 219
- time
GHG emissions remain in
atmosphere 151
and prices 69–71
reduced work 248–9, 327–30
- trading
emissions 54, 68, 76, 284–5, 321–4
international 24, 110–11, 188–93,
242, 336–7
- ‘treadmills’ 213
- Trudeau, J. 43
- Trump, Donald 29, 149, 243, 270
- UN Framework Convention on
Climate Change 143, 167, 203–4
‘uneconomic growth’ 213–14

- unemployment
 - arithmetic of reducing rate of 328–9
 - as cause of poverty 249–50, 282, 327
 - and economic growth 268–9
 - and GDP 334
 - growth as ‘remedy for’ 16, 241
 - and Keynesianism 12–14
 - policies for reducing working time to reduce 329–30
 - rates of 244–50
 - in Sustainable Prosperity Index (SPI) 281–3, 291–3, 298
- United Kingdom (UK)
 - absolute poverty 251
 - capital’s share of national income 299
 - on climate change 144, 148
 - coal and oil 102–3, 117
 - consumption-related GHG emissions 189
 - economic growth
 - average rates of 32–3
 - as insufficient for solving problems 268, 305–6
 - environmental performance ranking 267
 - example of absolute decoupling 175
 - fertility rates 308
 - first industrial revolution 51
 - full employment
 - average hours employed and 248–9
 - commitment to 13
 - government on 244
- GDP
 - per capita and ecological footprint 179–80
 - percentage change in, population and environmental indicators 266–7
 - percentage from expenditure on goods 192
 - percentage from expenditure on services 191
 - goods as percentage of exports and imports 192–3
 - government
 - on full employment 244
 - interpretation of sustainable development 25
 - households
 - below LIM 253–4
 - mean and median net wealth per 260
 - income inequality 256–7
 - LIM
 - after taxes and transfers 252–3
 - households below 253–4
 - material footprint 110–11
 - net replacement rate 249–50
 - population 266–7, 308
 - reduced work time 327
 - unemployment rates 244–7, 249
 - wealth distribution 261
- United States of America (USA)
 - absolute poverty 251
 - air pollution 139
 - capital’s share of national income 299
 - on climate change 144, 148–9, 151, 268
 - co-operatives 298
 - coal production 103, 118
 - consumption-related GHG emissions 189
 - critical materials 114–15
 - economic growth
 - average rates of 32–3
 - decline in rate of 186
 - green 206–7
 - as insufficient for solving problems 268, 305–6
 - as primary policy objective 30
 - emissions trading schemes 68, 321
 - environmental performance ranking 267–8
 - era of ‘uneconomic growth’ 213–14
 - ethanol production 123
 - full employment
 - average hours employed and 248–9
 - commitment to 13
 - government on 244
- GDP
 - composition of 184
 - and GPI 216–17, 219, 230
 - per capita and ecological footprint 179–80
 - per capita, real 210, 216
 - percentage change in

- GDP, population and environmental indicators 266–7
- percentage from expenditure on goods 192
- percentage from expenditure on services 191
- goods as percentage of exports and imports 192–3
- government
 - on full employment 244
 - interpretation of sustainable development 24–5
- households
 - below LIM 253–4
 - mean and median net wealth 260–61
- immigrants to Canada 311–13
- income
 - and happiness 211
 - inequality 256–7
- LIM
 - after taxes and transfers 252–3
 - households below 253–4
- material footprint 111
- natural resources
 - costs of 104–5
 - historical views on 103–5
- net replacement rate 249–50
- new technologies 335
- obesity 102
- oil extraction, unconventional 20, 121
- oil production 119–21
- poor performance of 243
- population 266–7, 308
- privatized health care 54
- reduced work time 327–9
- relying more on markets 57–8
- total end use of electricity 196
- unemployment rates 244–7, 249
- waste management organizations 153
- wealth distribution 261, 270
- useful goods 219–21, 223–6, 232–3
- utility 210–13, 218, 221–40
- valuation methods 81–7, 93
- Victor, P.A. 15, 37, 46, 49, 93–4, 120, 128, 130, 134, 182, 189–90, 200, 208, 211, 258, 265, 287, 295, 297, 302–3
- Von Hayek, F.A. 59
- water scarcity 33, 54, 147, 166–7
- wealth distribution
 - in Canada 262–3, 325
 - in decision-making hierarchy 318
 - as more unequal than income distribution 261, 325
 - and prices 71–2
 - in selected OECD countries 260–61
 - statistical data 260–61
 - in USA, South Africa, France and UK 261–2
- wealth inequality 260–63
- well-being
 - as affected by relative position 263
 - approaches to measuring 219
 - deficiencies of GDP as measure of 216–17
 - and economic growth 209, 213–14
 - factors influencing impact of rising incomes on 212–13
 - and GPI 216–19
 - growth and positional goods 220
 - index for subjective 212, 237
 - public good scenario 233–4, 237
 - purpose of HappyGrow 223
- willingness to accept 81–3
- willingness to pay 81–3
- work time, reduced 248–9, 327–30
- world happiness 214–16
- World War II
 - era of 11–12
 - post 10, 13–14, 103, 244, 304

