## Index

absorption capacities 17
ACEA (The European Automakers) 103
adaptation flexibility 56
Adriaanse, A.S. 30, 32, 168
Agenda 21, UNCED 127, 141–2
agricultural policy, Germany 155
Allenby, B.R. 6, 7
Ayres, L.W. 10
Ayres, R.U. 6, 10
Bartelmus, P. 2, 60, 119, 125
Bendell, J. 136
Benton, C. 45
best available technologies, on the demand side 179
biological diversity 39, 40
biomass 24
biowaste 14
Bleischwitz, R. 3, 10, 41, 47, 51, 132
Boltho, A. 50
Bringezu, S. 10, 18, 23, 30, 45, 59, 165, 172
Brundtland Commission 1
bubble economies 51
buildings
data 180–91
eco-efficiency 82–91
HEAT model 181–90
Bunde, A. 40
Burgess, S.M. 144
business sector, and eco-efficiency 11
business-as-usual (BAU) scenarios 181

**Capital** 126
Caroll, A.B. 136
carrying capacity 3–6, 7, 10
Chen, X. 30
Clean Japan Centre 50, 59, 162
clean-up costs 58
Club of Rome 10
‘Limits of Growth’ report 16
Commission of the European Communities (CEC) 43, 62, 83, 162
COMPASS methodology 136, 175
consumer policy, stakeholders in 145
consumers
  behaviour 142–3
  as social actors 144–5
consumption 3
  and social change 44–5
consumption patterns 142–3
contingent valuation 58
conventional supply technologies 179
conventional technologies, potential 180
COPOLOCO (Consumer Policy Committee) 128
Corbett, J. 50
corporate management tools 120
cost structure, transparency 129
cost–benefit analysis 57–8
cost-effectiveness analysis 57
critical load 4
CSR Europe 136
‘cycling economy’ 22
Daly, H. 6
data gaps 194
de-linking welfare/GDP from use of nature 12–13
del Rosario, T. 133
demand-side energy services, policies to stimulate 76–82
demand-side management (DSM) 77, 79–80
EU Process on 82
dematerialization 9, 16–22
  limitations 21–2
Denmark
  campaign for responsible entrepreneurship 136
Electricity Savings Trust (EST) 81–2
Energy Agency 80
energy efficiency policies 79–82
  green power 151
  Raw Materials Act (tax on waste and raw materials) 64–7
deployment rates 3
‘Design for the Environment’ (DFE) 126
detoxification 9
developing world 39–40
DIN German Institute for Standardization 123
direct material input (DMI) 29
  disposal regulations 3
DIW (German Institute for Economic Research) 148
Dixit, A.K. 52, 111
domestic extraction, raw materials 174
domestic material consumption (DMC) 30
domestic processed output 30
Douglas, M. 142
eco-efficiency 9–11, 42–4
  and the business sector 11
definition 10
generic ratios 11
measurement 45
  related to buildings 82–91
eco-oriented behaviour, and new energy services 151–5
eco-taxes 48, 193
Ecocycle Act 97
ecological goods and services 160–61
ecological rucksacks 176
economic incentives 48, 56, 193
economic instruments 63
Economic and Social Research Institute (ESRI) 50
economy-wide material flow balances 27–30
Ecotec 64, 67
EEA see European Environment Agency
  efficient entrepreneurship 128–34
EFR (European Ferrous Recovery and Recycling Federation) 103
Eicke-Hennig, W. 149
EMAN network 126
EMAS (Eco-Management and Audit Scheme) 119, 120–21
  Germany 121–2
  and ISO 1401 126
  EMAS II regulations 122
  Empacher, C. 142
  employment 49, 62
end-of-life vehicles (ELVs)
  European Union directive 98–100, 106
  and the motor industry 101–3
  exclusion of specific materials 103
  financing of measures 106
  free of charge return 103
  fund models 100–101
  material flows 92
  recycling 93–6
    industry 103
    quotas 102
  regulation in Germany and Europe 91–104
  shredder residue 95
end-use energy 77, 78
energy data 176–80
  commercial/service sector 178
  industry 177–8
  residential sector 177
  and transport 178–7
energy consumption 147–55
  heating 147–9
  household 151
OECD private energy consumption study 155
energy efficiency 43
energy services 77, 78
Enquête Kommission 3
entrepreneurship 118–19, 120
  efficient 128–34
  green 118, 119–28
  responsible 134–9
environment
  and life style 144
  value of 58
‘Environmental Communications’ 126
‘Environmental Headline Indicators’ 28
environmental management 43
environmental management accounting (EMA), and ISO 14000 126
environmental management systems (EMS) 119–20
  acceptance 124–5
  and SMEs 133
environmental performance evaluation (EPE) 125–6
environmental policy 2, 18
environmental space 3–6, 111
for major resources 5
equal allocation 4
European Climate Change Programme 82
European Commission 109, 135, 136, 140
Energy Efficiency Action Plan 82
Environmental Action Programme 111
European Commission (Directorate General for the Environment) (DG ENV) 23, 62
European Court of Justice 72
European Declaration of Business against Social Exclusion 136
European Environment Agency (EEA) 3, 10, 48
European Parliament, directive on electricity and natural gas 76–7
European Union 3, 72
end-of-life vehicles directive 98–100, 106
Process on demand-side management (DSM) 82
Eurostat 27, 28, 169, 174, 175
aggregated economy-wide material flow balances 171–6
Factor Four 9, 10, 41, 42, 47, 51, 109, 111, 161, 194
as an open target 110–12
best practices 53–5
Factor Ten 9, 10, 42, 111, 161
Factor X 9–11, 13
Figge, F. 129, 135
financial services 43–4
Finland, environmental headline indicators 110
Fischedick, M. 183
Foran, B. 30
Fortune 128
four pillars of sustainable development 2
Framework Convention on Climate Change (FCCC) 39
Freeman, R.E. 135
freight transport, data 179
FSO (Federal Statistical Office) 32, 148
fund models 100–101
Netherlands 100
Furubotn, E. 109
Gege, M. 129
genetically modified foods (GMOs) 159
Geological Survey of Sweden (SGU) 63
Georgescu-Roegen, N. 6
German Council for Sustainable Development 135
‘German Environment Barometer’ 110
German Environment Index 110
German Environmental Economic Accounting (GEEA) 168–70
PIOT (physical input–output tables) 170–71
German National Sustainability Strategy 194
Germany
agricultural policy 155
ARGE-altauto 91, 98
building types 182, 183
construction initiatives 86–7
consumer behaviour 143
Council of experts on environmental questions (SRU) 104
Electricity Feed Act (StrEG) 71
Electricity and Gas Supply Act 71
ELV Act 96–7
ELV voluntary agreement 97, 106
EMAS (Eco-Management and Audit Scheme) 121–2
end-of-life vehicles (ELV) regulation 91–105
Energy Conservation Regulation 83–91
energy consumption 147–9
energy market 149
energy measures 114
Environmental Protection Agency (EPA) 121, 169
environmental targets 110
Guideline for Sustainable Building 87–8
household energy consumption 151, 152
integrated environmental and economic accounting 168–71
ISO 14001 revision 123–5
MFB comparison with Japan and the United States 32–7
Ministry of Environment, and the ELV Act 104
organic food 155–7
Power Industry Act 70
Renewable Energy Sources Act (EEG) 69–76
‘The Socially Integrative City’ programme 88–91
sustainable consumption 145
vehicle recycling industry 103
vehicle return and dismantling system 101
wind energy 74
wind energy usage 153
Global Reporting Institute (GRI) 128, 135, 139
government initiatives 150
government regulation 150, 194
governments, role of 14
Graedel, T.W. 7
Gravgaard Pedersen, O. 25
green entrepreneurship 118
in Europe 119–28
green purchasing 131, 132–4
Green-e Certified Electricity Products 151
Gross Domestic Product (GDP) 12
Hamm, U. 158
Hammati, M. 137
Hamner, B. 133
Hansen, U. 145
Hawken, P. 40
hazardous substances in vehicles 99
health 3
HEAT model
  climatological factors 187
  computer-aided design heat loss 185–6
data 186–7
development of leading indicators 190
existing building work 187–8
heating gains 189–90
heating insulation measure 190
Japan 180, 181–6
  building values 187
  transmission heat requirement 188–9
  ventilation heat requirement 189
heating 147–9
hedonic pricing 58
Hellberg, J. 63
Hemmati, M. 137
Hill, C.W.L. 48, 52
Hillary, R. 124
Hille, J. 4
Hinterberger, F. 9
Hoffmann, J. 135
Hook, R. 94
horizontal co-ordination 132
household energy consumption 141, 152
Hroch, N. 119, 133
Hukkinen, J. 45
Human Development Index (HDI) 12
human health 3
Imura, H. 50
Index of Sustainable Economic Welfare (ISEW) 12
indirect flows, EU-wide database 175
industrial ecology 7–8
definition 7
  models of systems 7–8
industrial metabolism 6, 32, 33
information and communication services 44
innovation 42, 43, 193
innovation-inducing regulation 45–50, 56
input-oriented policy approach 19–20
Institute of Ecological Economics 161
integrated product policy (IPP) 20, 60, 126, 141
integrated resource planning (IRP) 77
intensity 10
Intergovernmental Panel on Climate Change 39
International Dismantling Information System (IDIS) 94, 96
Isacsson, A. 30
Isherwood, B. 142
ISO 14000, and EMA 126
ISO 14001, and EMAS 124
ISO 14031, guidelines on ‘environmental performance evaluation (EPE)’ 125–6
ISO 14062 126
ISO (International Standards Organization) 139
COPOLOCO (Consumer Policy Committee) 128
institutional activities 126–8
ISO/TC 207 127, 139

Jackson, T. 12
Jänicke, M. 52
Japan 8, 13, 50
carbon taxes 48
construction minerals 62
end-of-life vehicles 92, 93, 106
HEAT model 180, 181–6
ISO 14001 revision 122–3
MFB comparison with Germany and the United States 32–7
National Institute for Environmental Studies (NIES) 168
space cooling 148
wind energy usage 153
Japan Information Network 187
Juuitinen, A. 30

Keddie, A. 124
Kerber, W. 135
Klare, R. 40
Kleminschi, H. 133
Klinkers, L. 109
Komiyama, H. 40
Kuckartz, U. 142
Kuhndt, M. 44, 45, 136, 140
Kunert company 126
labour productivity 41, 42
Lamont, A. 48
landfill taxes 52
Langlois, R.N. 52, 135
Lazonick, W. 50
Lechtenböhmer, S. 183
Liedtke, C. 44, 45, 126, 129, 136
Liesgang, D.G. 135
life cycle assessment (LCA) 24
life style
and environment 144
and organic food 160
‘Limits of Growth’ report, Club of Rome 16
Linde, C. 44, 47
Little, A.D. 150
long-term changes 51–2
Lorek, S. 144, 155

Maddison, A. 41
Mäenpää, I. 30
man-made outputs, and the environment 3
market analysis, integrated approach 146
market failures 193
Marks, N. 12
material cycle policy measures 60–61
material flow accounting or analysis (MFA) 22–31, 165
definition 23–6
overview in selected countries 166–7
Type I 24
Type II 24–5
material flow balances (MFB) 25, 31–2
aggregated economy-wide material flow balances, Eurostat 171–6
balance indicators 31
comparison of Germany, Japan and the United States 32–7
consumption indicators 30
economy-wide 27–30
efficiency indicators 31
input indicators 29–30, 35
output indicators 30, 36
material flows 3, 17, 18–19, 39, 46, 165–76
data on 165–76
decomposition 18
deco-d of life vehicles 92
information gaps 176
measurement 45
material inputs, data sources 172–3
material outputs, data sources 174
Matthews, E. 32, 39, 45, 168
Matzner, E. 111
Meacher, Michael 110
Meadows, D. 16
‘Measuring Environmental performance of Industry’ (MEPI) 133
Metcalfe, J.S. 51, 109
Minsch, J. 161
Mitchell, A. 144
Moffat, I. 45
Monczka, J. 131
Montesquieu, Baron de 52
Morgan, J. 131
Moriguchi, Y. 25, 165, 168
motor industry
and ELV directive 101–3, 106
and recycling 91
Mündl, A. 30
Muukkonen, J. 30

Nakata, T. 48
The Natural Step Framework (TNSF)
8
the natural step (TNS) 8–9
negative income tax 49
Neitzel, H. 145
Nelson, R. 48, 52
net additions to stock (NAS) 31, 37
Netherlands
environmental headline indicators
110
fund model 100
new energy services, and eco-oriented
behaviour 151–5
New Institutional Economics 109
new technology paths 49
NGOs (Non-governmental Organization)
137
Nomura Research Institute (NRI) 50
North, D.C. 52

Oates, W. 48
OECD 43, 48
private energy consumption study
155
Sustainable Buildings Project 86
organic food 155–60
customer profiles 157, 159
market analysis 156–60
market channels 159–60
Ostrom, E. 109

Pacchi, C. 145
Pallab, P. 135
passenger transport, data 178
Pauli, G. 13
Peters, T. 94
Pfeiffer, C. 151
physical input–output tables (PIOT) 25
physical trade balance (PTI) 31
Pischon, A. 135
Plante, M. 100
Poldy, F. 30

policies, to stimulate demand-side
energy services 76–82
policy cycle 47
pollution control 44
Porter, M. 44, 47
Powell, A. 132
PRAVDA 2 Project 95
precautionary principle 3, 14
private energy consumption study,
OECD 155
private households 145
process control 44
product chain approach 131–2
productivity 40–41
Qiao, L. 30
quality 44

raw material taxes 59–69, 193
Sweden, Denmark and the UK 63–9
raw materials, domestic extraction 174
recycling 11, 22, 49, 59, 194
des of-life vehicles 93–6
and the motor industry 91
regulatory policies 56
Reisch, L. 144
rematerialization, limitations 21–2
Ren, Y. 50
renewable energy 11
renewable energy potential, data 179–80
research 41
resource extraction 17
resource productivity 9–11, 10, 41, 44,
111
resource requirements, reduction 11
responsible entrepreneurship 134–9
European experiences 136–7
moves towards 137
Richter, R. 109
Robertson, P.L. 52, 135
Rohn, H. 133
Russel, T. 133

Sachs, W. 2, 3, 10, 16, 19, 109, 110
Schaltegger, S. 119, 129, 133
Scherhorn, G. 144, 145
Schlegelmilch, K. 48
Schmidheiny, S. 43
Schmidt-Bleek, F. 9, 10, 22, 40, 59, 111

Scholl, G. 146
Schrader, U. 145
Schütz, H. 30, 172
Seifert, E.K. 125, 126
self-interest 193
service orientation 10–11
Simonis, U.E. 6
6th Environmental Action Programme (6EAP) 23
SMEs (small and medium sized enterprises) 128, 130–31, 140
and environmental management systems (EMS) 133
Sobel, M.E. 144
social change, and consumption 44–5
Spangenberg, J.H. 144, 155
Spicer, A. 95
Stahmer, C. 25, 171
stakeholder, in consumer policy 145
stakeholder approach 135–6, 141
standards
ISO 14000 43, 119, 126
ISO 14001 9, 119, 122, 124
revision, Japan and Germany 122–5
ISO 14031 125–6
ISO 14062 126
ISO (International Standards Organization) 126–8, 139
ISO/TC 207 127, 139
Starik, M. 135
statistical systems 61
Strassert, G. 6
Strobel 129
substance flow analysis (SFA) 24
sustainability
definition 2
four rules of 3
SustainAbility-London 128
Sustainable Buildings Project, OECD 86
sustainable business development
approaches to 117–19
phases of 118
strategies 116–41
sustainable consumption 141–63
definition 143–4
Germany 145
market fields of 147–63
sustainable development
concept 1–3
definition 2
equity and global perspective 2
four pillars of 2
‘Sustainable Germany’ 110
sustainable industry, factors hindering 137, 138–9
sustainable resource management (SRM) 60
Sweden
environmental headline indicators 110
tax on natural gravel (aggregate tax) 63–4
System of Integrated Environmental and Economic Accounting (SEEA), United Nations 171
System of National Accounts (SNA) 23
Takala, T. 135
target oriented policies 107–12
Factor four as an open target 110–12
open targets 108–9
quantitative targets 108, 109–10
Task Force for Climate Change (TFCC) 126
Task Force on Future Vision/Planning (TFFV) 126, 127, 139
taxes
carbon taxes, Japan 48
Denmark 64–7
eco-taxes 48, 193
landfill taxes 52
negative income tax 49
raw material taxes 59–69, 193
Sweden 63–4
technological change 41
technological progress 49–50
Tempelman, E. 100
Teramoto, Y. 45
thresholds of harm 4
Tomorrow 127, 139
total domestic output (TDO) 30
total material consumption (TMC) 30
total material requirement (TMR) 29–30, 34
‘Towards a Sustainable Aluminium Industry’ 136
transport, in relation to energy 178–7
Ueta, K. 48
UNCED (United Nations Conference on