

# Index

- adaptation, 41
  - private, 41
  - public, 41
  - social cost-benefit analysis, 95
- air pollution
  - behavioural anomalies and willingness to pay, 47
  - clash in goals of energy and climate policy, 41
  - distributional effects, 225
  - energy tax, 177
  - environmental tax reform, 179
  - fossil fuel subsidies, 23
  - goals of energy policy, 163
  - indoor air pollution, 36, 71
  - levels of air pollution, 12
  - license plate-based driving restrictions, 220
  - marginal external benefit curve, 193
  - negative externalities, 24
  - negative externality problem in developing countries, 45
  - policy instruments, 167
  - pollution standards and monitoring in developing countries, 219
  - positive externality, 182
  - positive externality with energy standard, 212
  - regulation in India, 220
  - social cost, 95
  - taxes and unintended effects in developing countries, 202
  - willingness to pay for air quality improvements, 96
  - willingness to pay for improvements in air quality, 220
- allocative efficiency, 222
- behavioural anomalies, 167–169
  - bounded rationality, 34–37
    - cognitive limitations, 34–36
    - endowment effect, 34–36
    - framing effects, 36
    - limited use of information, 36
    - loss aversion, 34–36
    - status quo bias, 34–37
  - bounded selfishness, 34
  - altruism, 36
  - fairness, 36
  - social norms, 36–37
- bounded willpower, 34–37
  - attitude-behaviour gap, 36
  - myopia, 36
- meaning, 3
- monetary market-based instruments, 191–194
- non-market-based instruments, 216–217
- productive Inefficiency, *see* Xinefficiency
- biomass, 19
  - fuel-stacking behaviour, 71
  - progressivity of carbon pricing, 227
  - social spillovers, 37
- Cap-and-trade system. *See also* pollution permit trading system 187
- cash flows
  - coefficient of variation, 83
  - discounting, 76
  - expected value, 82–85
  - standard deviation, 82
- causality, 233
- climate policy
  - distributional effects, 225–227
  - goals, 39–41, 163–164
  - modelling effects, 228
  - types, 165
    - private, 167
    - public, 165–167
- coal
  - allocative efficiency, 223
  - clash in objectives of energy and climate policy, 41
  - clean development mechanism, 200
  - energy tax, 177
  - energy transition, 14, 15
  - environmental tax reform, 180
  - external costs, 87
  - fossil-fuel subsidies, 200
  - intangible costs, 95
  - LCoE in comparison to other technologies, 89
  - LCoE values, 89
  - market forms, 32
  - negative externalities in developing countries, 46

- non-renewable energy source, 12, 18
  - pollution standard, 206–210
  - pollution tax, 25, 173–176
- continuous emissions monitoring systems, 219
- decentralised energy systems, 99–100
- direct control measures, 214
  - curtailment of appliance use, 214
  - license plate-based driving restrictions, 220–221
- discount factor, 76
- discount rate, 76
- discounting
  - capital productivity, 76
  - decreasing marginal utility of income, 98
  - time preference, 76
- Diseconomies of scale. *See also* economies of scale 129
- dynamic efficiency, 223
- economic models, 228
  - agent-based models, 232
  - applied general equilibrium models, 229
  - DICE model, 232
  - economic growth models, 231
  - EMEC, 229
  - energy system models, 230
  - GEM-E3, 229
  - integrated assessment models, 231
  - MERGE model, 232
  - microeconomic structural models, 230
  - partial equilibrium models, 229
  - RICE model, 232
  - TIMES, 229
  - top-down models, 229
- economies of density, 130–131
- economies of scale, 129
  - centralised production structures, 130
  - computation, 129
  - network-based production structures, 130–131
- economies of scope, 133
- economies of vertical integration, 134
- elasticity of demand
  - cross-price, 60
  - income, 61
  - own-price, 60–61
- elasticity of substitution, 67
- electric cars
  - asymmetric information, 30
  - experimental evaluation of a subsidy, 235
- electricity theft, 125
- energy conservation building code, 219
- energy economics, 1–2
- energy efficiency
  - definition, 102
  - energy intensity, 106
  - energy productivity, 106
- investment decisions, 111
- measurement, 105
  - econometric approaches, 108
  - partial indicators, 105
  - reasons for inefficiency, 103
  - stochastic frontier model, 108
- energy efficiency gap, 114
  - bounded rationality
    - cognitive limitations, 116–117
    - limited attention, 116–117
    - loss aversion, 116–117
    - present bias, 116–117
  - bounded willpower
    - cognitive dissonance, 116–117
- energy-related financial literacy, 119–120
- non-market failures
  - hidden costs, 116–117
  - uncertainty, 116–117
- private, 114
- social, 115
- traditional market failures
  - asymmetric and imperfect information, 116
  - capital market imperfections, 116
  - negative externalities, 116
  - positive externalities, 116
  - split incentives, 116
- energy policy
  - difference with climate policy, 163
  - distributional effects, 225–227
  - goals, 39–41, 163–164
  - modelling effects, 228
  - types, 165
    - private, 167
    - public, 165–167
- energy transition, 14–20
- energy-ladder hypothesis, 70
- energy-stacking behaviour, 70
- enforceability and administrative practicality of policies, 225
- equi-marginal principle, 176
- external pressures (firms), 38
- fairness, 224
- fuel-stacking behaviour. *See* energy-stacking behaviour
- geothermal energy, 19
  - LCoE in comparison to other technologies, 89
- greenhouse gas emissions, 8, 10, 11
- atmosphere as a common resource, 28
- clean development mechanism, 200
- distributional effects, 225
- goal of climate policy, 40, 163
- impact of energy policy, 164
- permit trading systems, 187
- role of industrialised countries, 165

- homo economicus, 38
- hydrogen, 19
  - energy transition, 14
  - storage, 147
- hydropower, 19
  - application of IRR, 78
  - energy transition, 14, 15
  - intangible costs, 95
  - nature of costs, 128
  - persistent and transient cost efficiency, 39
  - resource rents, 136–137
  - social cost-benefit analysis, 93
  - socioeconomic impacts in developing countries, 97
  - solutions for intermittance, 16
  - use of natural resource, 136
  - water fee, 136
- information and educational programmes, 194–195
- internal pressures (firms), 38
- internal rate of return, 77–78
- isocost
  - energy efficiency, 103–105
- isocost line, 53
- isoquant, 53
  - energy efficiency, 103, 105
- learning curve, 89
  - elasticity of learning, 91
  - elasticity of learning-by-researching, 92
  - learning-by-doing rate, 92
  - learning-by-researching rate, 92
  - one-factor, 91–92
  - two-factor, 92
  - types of learning, 90
- levelised cost of energy, 85
  - definition, 85
  - limitations, 86
  - values at the global level, 87
- linear probability model (estimation of demand), 63
- long-term Agreement on Energy Efficiency for
  - non-ETS sectors, 218
- LPG, 36, 157, 200
- management practices, 69
- marginal abatement cost, 173
- marginal rate of technical substitution, 53
- market failures, 2, 167–169
  - behavioural
    - anomalies. *See* behavioural, anomalies
    - common resources, 27–29
    - credit/liquidity constraints, 46, 123
    - externalities, 23–26
      - negative externalities, 24–25
      - positive externalities, 25–26
    - information problems, 29–30
      - asymmetric information, 30
      - imperfect information, 29
    - lack of competition, 31–34
      - monopolistic competition, 33–34
      - natural monopoly, 32
      - oligopoly, 32
    - principal-agent problems, 30–31
    - public goods, 26–27
  - market forms
    - electricity markets
      - activities, 144
      - day-ahead power market, 146–149
      - merit-order principle, 147
      - modern approach, 144–149
      - reforms, 149
      - retail electricity market, 146
      - system-marginal price, 147
      - traditional approach, 144
      - wholesale electricity market, 146
    - gas markets, 157
    - monopolistic competition, 127–128, 150–151
      - characteristics, 150
    - monopoly, 127–128, 135
      - causes, 135
      - characteristics, 135
      - natural monopoly, 135, 137
      - price-cap regulation, 141
      - rate of return regulation, 138–140
      - regulation, 138
      - resource rents, 136
      - yardstick regulation, 141
    - oil markets, 157
    - oligopoly, 127–128
      - cartel model, 152–154
      - characteristics, 152
      - dominant firm model, 155–156
    - perfect competition, 127–128, 142
      - characteristics, 142
- net present value, 77–78
- net zero, 16, 17
- non-excludability, 27
- non-rivalry, 27
- nuclear energy
  - assumptions for calculating the LCoE, 89
  - effect of high social discount rates, 98
  - nature of costs, 128, 136
  - non-renewable energy source, 18
  - uncertainty in costs, 81
- nudges, 195
  - eco-labels and energy labels, 196
  - examples in the energy sector, 196
  - limitations, 198
  - types, 195
- OECD, 13, 14
- OPEC, 32, 152, 154
- parallel trends assumption, 238

- particulate matter, 12, 13
- policy acceptance, 225
- policy effectiveness, 224
- policy evaluation, 228
  - methods, 232
    - difference-in-Difference, 236–240
    - experimental, 233
    - quasi-experimental, 233
    - RCT, 233–236
    - regression discontinuity design, 240–242
- pollution permit trading system, 187
  - comparison to pollution tax, 190–191
  - functioning, 187–190
- pollution tax
  - negative externalities, 25
- poor quality of power, 124–125
- price versus quantity-based instruments, 191
- productive efficiency, 222
- rebound effect, 120–123
  - direct, 121
  - indirect, 121
- renewable energy
  - types of, 18–20
- resource curse, 160
- revealed preference methods
  - hedonic pricing, 95
  - travel cost method, 95
- revenue losses for utilities, 125
- risk, 81
  - measures of, 82
    - risk-adjusted discount rate, 82
  - types of, 81
- rivalry, 27
- salience, 190
- social cost-benefit analysis
  - indirect/secondary benefits and costs, 94
  - intangible benefits and costs, 94–96
  - kaldor-Hicks Criterion, 97
  - net present value criterion, 97
  - primary benefits and costs, 93–94
  - social discount rate, 98
  - steps, 93
- solar energy
  - levelized Cost of Energy (LCoE) calculation, 87
  - adoption in rural India, 71
  - altruism, 36
  - clash between energy and climate policy, 40
  - decentralised systems, 99, 100
  - distributional effects of subsidies, 226
  - energy transition, 14, 15
  - financing in developing countries, 101
  - high prices and energy poverty, 23
  - imperfect information, 29
  - intermittance, 100
  - land as a common resource, 29
  - LCoE in comparison to other technologies, 89
  - LCoE values, 89
  - learning curve, 90
  - learning-by-doing rate, 92
  - main uses, 19
  - monopolistic competition, 150
  - nature of costs, 128
  - positive externalities, 25
    - knowledge sharing, 25
    - security of supply, 25
  - solutions for intermittance, 16
  - subsidies, 23, 184
  - subsidy on investments costs in Switzerland, 78
- standards
  - comparison to taxes, 204
  - energy standards, 211
    - efficiency, 212–214
  - enforcement in developing countries, 219
  - performance-based, 204
  - pollution standards, 206
    - a single polluter, 206–207
    - enforcement, 210–211
    - two polluters, heterogeneous abatement benefits, 208–210
    - two polluters, heterogeneous abatement costs, 207–208
  - technology-based, 203
- stated choice methods
  - choice experiment, 95
  - contingent valuation, 95
- subsidy, 181
  - challenges, 186
  - examples, 182
  - feed-in-tariff, 185–186
  - fossil-fuel subsidies, 200–201
  - initial subsidies, 184
  - justification for use, 182
  - positive externalities, 26
- sustainable development, 42–45
  - institutional definition, 42
  - strong sustainability, 44–45
  - three dimensions, 43
  - weak sustainability, 44–45
- tax, 169
  - double-dividend hypothesis, 179–181
  - energy tax, 177–178
  - environmental tax reform, 179–181
  - environmental tax. *See also* pollution tax 173
  - pollution tax, 173–177
    - benefits and challenges, 178
    - comparison with permit trading systems in developing countries, 199
  - product tax, 171–173
    - benefits and challenges, 178

- tax (cont.)
  - comparison with pollution tax in developing countries, 199
- tidal energy, 19
- time-varying pricing, 215–216
  
- UN, 29, 167
- unbundling, 144
- uncertainty, 81
- UNEP, 219
  
- voluntary agreements, 218
  
- weighted average cost of capital, 78–79
  
- Wind energy
  - LCoE calculation, 87
  - energy transition, 14, 15
  - generation, 19
  - intermittance, 100
  - land as a common resource, 29
  - LCoE in comparison to other technologies, 89
  - LCoE values, 89
  - merit-order, 148
  - nature of costs, 128
  - solutions for intermittance, 16
- X-inefficiency, 4