

# Index

---

- acid rain 59
  - see also* SO<sub>2</sub> emissions trading scheme
- Albedo effect 14
- allocation criteria 101, 112, 120–121, 128
- allowance 50, 58–63, 75
- allowance, allocation of 67–8, 76, 100, 107, 120–121
- allowance, amount of 80, 82, 89, 123, 128, 131, 133, 151
- allowance, price of 75, 118, 120
  - see also* CO<sub>2</sub> price
- Annex-I countries 27, 28–9
  - see also* industrialized countries
- approved cap 83–4, 89–90, 91–2, 98–9
  - see also* ETS cap
- auctioning 7–8, 56–7, 60, 100–101, 110–111, 129–131
  - see also* allocation criteria; ETS allocation rule
- auctioning
  - and carbon leakage 131–3, 155
  - and consistency with efficiency
    - interpretation of the polluter-pays principle 110, 112, 118
  - and consistency with equity
    - interpretation of the polluter-pays principle 113, 120, 129
  - and private costs 105, 113, 128
  - and public revenue 56, 113, 146
  - ETS sectors exempted from 133–4, 136, 139, 141–4, 155
- Austria 91
- banking of allowances 63, 81–2
- bargaining of allowances 48–50, 54, 75, 110, 118
  - see also* Coase theorem; making or buying
- baseline year updating process 114–15
  - and closure of inefficient plants 117
  - and early action problem 115–16
- Belgium 91, 92
- benchmark 80–81, 84–5
  - and over-allocation assessment 6, 86, 88–91, 148–9
- bilateral accident 40, 41, 48
  - see also* liability rule; negligence rule
- bottom-up approach 54, 146
- bubbling 29
- burden sharing agreement 29–30, 65, 86
- business as usual emission scenario 14, 15, 18, 80–81, 84–5
- Canada 59
- cap and trade 37, 48–51, 52, 54, 56–7, 62, 68, 146–7
  - and international cooperation 53–4
  - and political acceptability 56
  - and regulatory capture 56–7, 116
- carbon capture and storage 47
- carbon intensity 11–13, 46–7, 55, 69, 80, 134–36, 137–9, 142
- carbon leakage (CL)
  - causes of 154–7
  - and EC assessment methodology 134–6, 137
  - and EC assessment results 139, 143–4
  - risk of 123, 131, 133–4, 138
- carbon price *see* CO<sub>2</sub> price
- carbon tax 52–4, 56, 112–13, 146
- CCGT plant 76–9, 95–7, 108
- cement, clinker or lime 64, 141
- Chicago school 55
  - see also* political economy; regulatory capture
- China 14

- clean development mechanism (CDM)  
29, 31, 54–5, 93, 146  
*see also* flexible mechanism;  
international credits
- climate change 4–5, 9–10, 13–14
- climate change, economics of 16–20
- climate change, mitigation of 14, 16,  
19–20, 22, 28, 42, 54–5, 155
- climate policy, credibility of 94, 127,  
133  
*see also* European climate policy
- climate scenario 5, 9, 13–16, 18, 81
- CO<sub>2</sub> emissions 10–13, 15, 18, 28, 77,  
81
- CO<sub>2</sub> emissions, reduction of 3, 5–6,  
12–13, 16–18, 21–3, 28, 31,  
50–53, 63, 68, 72–3, 74–5, 77–8,  
81–2, 85, 108, 129
- CO<sub>2</sub> price 18–19, 70, 72–3, 75, 77–80,  
82, 84, 95–7, 100, 107–110, 124
- CO<sub>2</sub> theoretical coal-to-gas switch  
price 6, 72–3, 76–9, 95–7, 108
- coal 15, 69, 71–3, 76–9, 95–7, 107–108
- Coase theorem 2, 48–9, 110, 112, 119
- collective action 3, 16, 31–2
- combustion installation 64, 140–41
- command and control 36–8, 43–6,  
50–51
- common but shared responsibilities  
principle 26–7, 29
- common good 34  
*see also* tragedy of the commons
- Community International Transaction  
Log (CITL) 87, 138–9, 140–42
- competition 45, 54, 70, 106, 132, 151–2
- competitiveness 120–21, 132, 147, 151  
*see also* carbon leakage; exposure to  
international competition
- compliance 6, 23–4, 28–30, 36–7,  
43–4, 50–52, 58, 63–4, 74–5, 93–5,  
118–19, 147–9, 155–7
- Conference of the Parties (COP) 27
- consumer 100, 107, 112–13, 150  
*see also* windfall profits
- cost-benefit analysis 16, 19, 36, 41, 43,  
45  
*see also* marginal cost; marginal  
benefit
- cost-effective 2, 26, 31, 35, 51, 55–6, 68,  
74–5, 85, 93–5, 145–7
- cost increase, assessment of 107, 131,  
134–6, 138–9, 142–3, 153
- cost internalization 20–21, 34, 35–6,  
38, 42–3, 45–6, 51–2, 75, 77,  
101–104, 106–108, 110–13, 119,  
150–52
- Council Decision 280/2004/EC 87
- cross-subsidization 7, 93, 119, 121,  
152
- Czech Republic 92
- delocalization *see* carbon leakage
- demand, function of 39, 50, 68–9,  
70–71, 108–109
- Denmark 59, 92
- developing countries 5, 9, 12, 27, 29,  
31–2, 55, 133, 137–8,
- Directive 2003/87/EC 51, 59–67, 82, 87,  
114, 122  
*see also* European climate policy  
and Annex III 65–6, 123, 148
- Directive 2009/29/EC 122, 128, 131,  
153  
*see also* European climate policy;  
new ETS directive; European  
Climate Package
- discount rate 19–20
- distortion of competition 94–5, 111,  
114, 121, 123–4, 128–30, 152
- dynamic efficiency 44, 46–7, 56,  
68
- Dynamic Integrated Model of Climate  
and the Economy (DICE) 20
- Earth Summit *see* United Nations  
Conference on Environment and  
Development
- economic agent 2, 34, 50–51, 112, 114,  
115–16, 117, 132, 147
- economic analysis 3, 16, 39, 101
- economic growth 11–12, 30, 33, 132,  
145, 154
- economic instrument 36–8, 44, 51–2,  
56, 60, 68, 102, 121, 145–6  
*see also* market-based instrument
- economic literature 2, 20–21, 34, 44,  
52, 62, 146
- economic model 5, 9, 16, 22, 30
- economic principle 28, 34, 51, 58, 101,  
103–104, 144

- economic theory 21, 23, 25, 55–6, 109, 110, 129,
- effectiveness of the ETS 3–4, 67–8, 74–5, 80–82, 94–5, 118, 122–3, 125–7, 130
- elasticity 69, 112, 135  
*see also* trade intensity
- electricity generation 69, 70–72, 76–8, 95, 107–108
- electricity intensity 134–5
- electricity market 6, 59, 68–71, 77–8, 109
- electricity price 70, 95–6, 100, 109–110, 139
- electricity sector 68, 141
- Ellerman and Buchner 79–81, 84–5
- emission gap 50–51, 64, 71, 86, 108, 120, 134
- emission permit *see* allowance;  
emission rights; tradable permits
- emission projections 13, 81
- emission reduction burden 3, 7, 59, 64–5, 66–7, 74, 93–5, 118–120, 124–7, 148–9
- emission reduction target 3, 28, 30, 52, 58, 65, 67–8, 82, 85–6, 89–93, 119, 124, 126, 133, 147, 149, 155–56
- see also* Kyoto target
- emission rights 48–9, 56, 59, 60, 62, 100, 105, 111, 113, 152
- Emissions Trading Scheme (ETS) 1–3, 6–8, 29, 51, 58–60, 62–5, 67–8, 74, 77–9, 94–5, 100, 106, 108, 114–15, 118, 122–3
- energy activities 64
- energy efficiency 13, 47, 51, 69
- energy installations 75, 130
- energy intensity 11–12
- energy-intensive installations 130–33, 134
- environment, exploitation of 21, 33, 37
- environmental damage 33, 38, 102
- environmental externality *see* externality
- environmental law 5, 25, 35, 43, 103
- environmental law and economics 101
- environmental regulation 51, 132, 153
- environmental principle 9, 37, 40, 48, 101, 103
- environmental protection 21, 25, 34, 38, 45, 48, 56
- environmental standards 56, 59
- environmentally-friendly technology 16–17, 19, 22, 107, 110
- Estonia 92, 115
- ETS allocation rule 3, 7, 100–101, 113–14, 119–20, 128–9, 150–52
- ETS allocation rule  
and distributive effects 112, 117, 120, 123, 129, 150–52  
and economic efficiency 3, 106, 128–9, 150–52  
and equity 3, 103–105, 112–13, 150–52  
and *ex-post* adjustment 59, 67, 114, 117  
and harmonization 94–5, 114, 120–21, 130, 144, 152, 157
- ETS cap 3, 6–7, 65–6, 74, 79–80, 82–4, 84–5, 89–91, 98–9, 118–19, 123–8, 148–9  
*see also* amount of allowances;  
approved cap; effectiveness of the ETS; proposed cap  
and emissions reduction 74, 92–3, 112, 119, 123  
stringency of 74, 80, 85, 89, 94–5, 101, 112, 119–20, 124, 127, 147–9, 152
- ETS cap setting  
and benchmark-based approach 125–6  
and cost-effective approach 125–6  
and distortion of competition 94–5, 123–4  
and equal effort approach 125–6  
and market harmonization, lack of 7–8, 59, 123  
and proportional reduction approach 125–6  
and status quo approach 125–6
- ETS cap setting centralized procedure 125, 127–8
- ETS cap setting decentralized procedure 67, 123–4
- ETS cap setting reform 4, 7–8, 125–8, 153, 156  
ETS Directive 4, 7–8, 60, 62–3, 67, 74–5, 82, 113, 122–3, 125,

- 127–8, 130–31, 134, 136, 138, 147–8, 153, 155
- see also* Directive 2003/87/EC; Directive 2009/29/EC
- ETS emissions 75, 79, 84, 86–8, 90–91, 119, 127–8, 148
- ETS, inefficiencies of 2–4, 7–8, 51, 74, 94, 101, 114, 117, 123, 147, 152, 154,
- ETS installations 62–7, 75, 80, 81, 85, 87, 110, 115–17, 120, 129, 132, 151–2, 153–4, 156
- ETS institutional framework 2–3, 51, 58, 68, 122, 127, 153, 155
- ETS proportional Kyoto target 88–89, 98–9
- ETS proportional Kyoto target range 89–94, 98–9
- ETS sectors 58–9, 64–6, 74–5, 79–80, 85–7, 89–90, 93–95, 118–19, 121–2, 123–5, 127, 147–9
  - and risk of carbon leakage 133–5, 139,
- ETS share 64, 74, 85–9, 90, 94, 95, 98–9, 118, 156
- ETS trading period 6–8, 62–3, 67, 74–5, 77–8
  - and allocation rule 114–15, 131
  - and ETS cap 82, 84–5, 122–24, 125, 127–8
- ETS trading phase 62–3, 65, 66, 75, 81–2, 149
  - and allocation rule 114–16
  - and ETS cap 89–91, 123–4
- European climate package 1, 62, 122, 124, 130, 133, 145
- European climate policy 3–4, 5–6, 58–60, 122, 127, 145
  - and coordination with national policy 59, 64, 95, 149, 156–7
  - and geopolitical asymmetry 5, 9, 32, 133, 154, 156–7
  - and normative arbitrage 132–3, 156
  - and unilateral approach 5, 9, 32, 122, 132–3, 153–6
- European Commission (EC) 2, 58, 85, 122, 145
  - and allocation rule 129–30, 150, 155
  - and carbon leakage 133, 134–5, 136, 137–40, 143
  - and centralized ETS cap setting 125–7
  - and guidelines 66, 134–5
  - and national allocation plans 82, 89–90, 92, 94, 123–4, 148
- European Council 122
- European Court of Justice 92
- European emissions 2, 64–5, 88, 122, 145, 149
  - and ETS emissions 7, 64–5, 74, 148
- European Environment Agency (EEA) 87–8, 141–2
- European Member States (MS) 3, 6, 28, 29–30, 53–4, 58–61, 63–4, 65–8, 80–81, 82, 84–5, 87, 89–92, 94–5, 120–21, 123–4, 148, 155–6
- European Parliament 122
- European Union (EU) 1–2, 28, 29–30, 53, 59–60, 66, 74, 86, 88, 89–90, 94–5, 127, 140–41
- ex-ante instrument 35–6, 42, 43
- ex-post instrument 35–6, 42–3, 50–51
- export ratio 136
- exposure to international competition, assessment of 121, 131–2, 135–6, 142–3
  - see also* trade intensity
- externality 5, 20–21, 33–36, 43, 45–8, 52, 155
- externality
  - and cost internalization 110, 112, 116, 119, 151, 154
- feedback loop 13–14
  - see also* Albedo effect
- ferrous metal *see* iron and steel
- final price 68, 107–108, 112, 120, 151, 153
- Finland 91
- first-best 34, 85, 106
- first trading period 75–79, 115, 125
  - see also* ETS trading period; ETS trading phase; pilot phase
- flexibility 5, 28, 30–31, 37–8, 54, 74, 157
- flexible mechanism 3, 5, 10, 20, 27–31, 36–38, 50–51, 92–3, 147, 157

- see also* clean development  
 mechanism; economic  
 instrument; joint  
 implementation; market-based  
 instrument; market-oriented  
 mechanism
- fossil fuel 10–11, 33, 47, 65
- France 92, 115
- free allocation 56–7, 60, 100–101,  
 112–13, 128, 131, 138, 150  
*see also* grandfathering  
 and carbon leakage prevention  
 128–9, 133, 155, 157  
 and lump-sum subsidy 111  
 and opportunity cost 106–107, 108,  
 109–110, 117, 154  
 and third trading period 131, 138–9,  
 141–3
- free-ride 22, 25
- fuel switching 59, 68, 71–3, 77–8, 95–7,  
 107–8
- gas-fired plant 69, 71–3, 76–9, 95–7,  
 108
- Germany 91, 100, 115, 117–8
- global public good 5, 9, 20–24
- global warming 3–5, 10–11, 16, 19–21,  
 25–6, 27, 31, 33–4, 43, 55, 145
- grandfathering 7, 56–7, 87, 100–101,  
 133, 146, 150–53  
*see also* allocation criteria; allocation  
 of allowances; ETS allocation  
 rule; free allocation  
 and auctioning 112–13, 120, 128–9,  
 132, 144, 156  
 and baseline updating problem  
 114–16  
 and closure rule 116–18  
 and ETS third trading period  
 129–31, 132  
 and lump-sum subsidy 111  
 and opportunity cost 107–108, 110  
 and polluter-pays principle 105–108,  
 112, 114, 118–20, 150–53
- Greece 91
- greenhouse gas (GHG) 1, 10, 11–13,  
 13–14, 20–22, 26–8, 51, 59, 63,  
 86–8, 89–90, 92–3, 141
- gross domestic product (GDP) 2,  
 11–13, 15, 18–19, 30, 31, 80
- Hardin G. 33
- harmonization 53–4, 123–4, 127, 153,  
 155–6  
 and allocation criteria 94–5, 114,  
 120–21, 130, 157  
 and internal market 59, 67, 125, 144,  
 152
- historical emissions 7, 10, 13, 56–7, 60,  
 65, 72, 80, 87, 100, 107, 110, 114,  
 116, 127–8, 138, 148, 151  
*see also* CITL; European  
 Environment Agency
- Hungary 92
- import 132, 135–6, 157
- import penetration ratio 135–6
- incentive  
 and cooperation 16, 21–2, 23–5  
 and emissions reduction 2, 36, 38,  
 50, 68–71, 75, 77–9, 114–16,  
 124–5, 129–30, 148  
 and technology innovation 13, 44,  
 46–8, 56, 68, 72, 107, 110
- incumbent 45, 56, 67, 115
- India 14
- industrialized countries 12–13, 27  
*see also* Annex-I countries
- industrial installations 59, 75, 130, 154
- industrial organization 22
- industrial production 11, 33, 45, 133–4
- industrial sectors 44, 59, 64, 121, 133,  
 137, 141  
*see also* Annex-I countries
- industry 30, 67, 94, 106, 150
- information 41–6, 49–50, 64–5, 82,  
 85–9, 138  
 and asymmetry 24, 42  
 and cost of 36–7, 41, 52, 149  
 and data collection 85–9
- integrated approach 136, 138–40, 142,  
 143, 156
- Intergovernmental Panel of Climate  
 Change (IPCC) 10–11, 14, 17
- international agreement 22–23, 24–5,  
 53, 133
- international competition 121, 132,  
 135–6, 142–3  
*see also* trade exposure
- international cooperation 4, 21–23, 25,  
 31, 53–4, 146

- international credits 93  
*see also* clean development mechanism
- International Energy Agency (IEA) 14–15, 18
- international law 22–3, 24, 25, 53, 102–3
- international treaty 5, 9, 25, 102–3, 122
- Ireland 91
- iron and steel 64, 141
- Italy 92
- Japan 59
- joint implementation 29, 54  
*see also* flexible mechanism
- Kaya equation 11–12
- Keohane R. 24, 25, 56
- Kyoto Protocol 2–3, 5–6, 9–10, 25, 27–8, 30–31, 54, 58–9, 62–4, 119, 122, 124, 145, 148, 153
- Kyoto target 2–3, 30–31, 52, 64–5, 68, 74, 80, 82, 85–6, 89–93, 94–5, 98–9, 146, 147, 149  
*see also* emission reduction target
- law and economics 3, 5, 23, 24, 34, 40, 62, 101, 146–7
- Latvia 92, 115
- legal instrument 35–7, 43, 56, 146
- legal principle 28, 55, 101, 102–104
- liability rule 35, 39–43  
*see also* negligence rule; strict liability
- low-carbon economy 1, 20, 67, 124
- lump-sum subsidy 111
- Luxemburg 91
- luxury good 34
- making or buying 51  
*see also* Coase theorem
- manufacturing installations 2, 130, 132, 139, 141
- marginal abatement cost (MAC) 2, 44, 50–51, 54–5, 66, 85, 110, 124–5, 127, 149
- marginal cost and benefit 16, 17, 21, 28, 39, 42, 45–6, 50, 52–3, 69, 71, 109–110, 116
- market-based instrument 37, 44, 52, 56, 60, 68, 157
- market efficiency 110, 114, 117, 130
- market failure 21, 34, 45, 48, 55
- market harmonization, lack of 8, 59, 67–8, 94–5
- market-oriented mechanism 2, 5, 36, 51
- market price 20, 50, 51, 71, 107, 108–9, 112, 119, 129, 133, 135, 151
- market share 108, 132, 134, 135
- Marrakech Accords 60
- member states *see* European member states
- merit order 71–2, 77–8, 107–108
- mineral oil refineries 64, 141
- NACE 4 137, 139–41
- Nash J. R. 101, 104, 106, 111, 116
- National Allocation Plan (NAP) 6, 58, 65–6, 67, 82–3, 114, 123–4, 125, 149
- natural resources, 19, 33–4
- negative externality *see* externality
- negligence rule 40–42
- negotiation 27, 31, 134, 157  
*see also* international agreement
- Netherlands 91, 100, 115
- new entrant 45, 57, 67
- new ETS Directive 7–8, 122–3, 127, 130–31, 134, 136, 138, 153  
*see also* Directive 2009/29/EC; European climate package
- non-Annex I countries 27, 29, 54  
*see also* clean development mechanism; developing countries
- non-ETS sectors 7, 64–6, 74, 80, 85, 87, 93–5, 119–20, 124, 125–7, 148–9, 156
- Nordhaus W. 17, 19, 20
- Norway 28, 59
- oil 14, 15, 19, 33, 64, 141
- oligopolistic market 109–10
- opportunity cost *see* free allocation and opportunity cost
- Organization for Economic Co-operation and Development (OECD) 14–15, 27, 102, 104

- outsourcing production and emissions  
132, 154, 156  
*see also* carbon leakage
- over-allocation 6–7, 74, 79–83, 88–95,  
118–19, 120–21, 148–9
- over-allocation, assessment of 79–82,  
85, 88–9
- over-allocation, consequences of 92–4
- pass-through  
and carbon leakage 142–3  
and degree of market competition  
109–110  
rate of 100, 109, 112
- perfect competition 109, 126
- permit scarcity 37, 50, 82, 84, 94, 95,  
118, 124, 125, 126, 127  
*see also* stringency of the ETS cap
- Pigou A. 46
- pigouvian tax *see* carbon tax, tax  
pilot phase 62, 78, 82, 124–5, 128,  
150  
*see also* first trading period
- Poland 92, 115
- political economy 3, 45, 55–6, 148  
*see also* Chicago School; regulatory  
capture
- polluter-pays principle 3, 7, 26, 40, 101,  
102–105, 111, 150–52  
consistency with 105, 114–15,  
118–20, 150–52  
efficiency interpretation 103,  
105–110  
equity interpretation 103, 112–13  
extended form 105  
strong form 105  
weak form 105
- Portugal 91
- post-Kyoto trading period 123, 129,  
153
- post-Kyoto treaty 122, 134
- power generation 71, 95–6
- precautionary principle 26, 48
- prevention principle 48,
- price-based mechanism 37
- price of allowance 75, 100, 118, 120  
*see also* CO<sub>2</sub> price
- price volatility  
and uncertainty 46, 52, 75, 124,  
149
- prices vs quantities 51–3, 70  
and distributive effects 56, 69
- principle of subsidiarity 6, 59, 66–8,  
148
- prisoner's dilemma 124, 148
- private law 35, 38
- product-based policy 154–5
- production-based policy 154–5, 156–7
- product life-cycle 135  
*see also* production-based policy
- property rights 48–9, 60–62, 146  
*see also* Coase theorem
- proposed cap 83–4, 89–90, 91–2, 98–9
- public law 35, 38
- pulp and paper 64, 141
- quantity-based mechanism 37
- reciprocity 21, 23–4
- redistributive effect 113, 117, 120, 146,  
150–51, 152
- reference scenario 15, 18
- regulation 5, 35–8, 43–4, 45–7, 51–2,  
54–7, 61
- regulatory capture 55  
*see also* Chicago School; political  
economy
- regulatory property 62
- reputation 24–25
- retaliation 24
- Rio Declaration on Environment and  
Development 26, 54, 102, 104
- Russia 19, 28
- second-best 48, 54, 85, 106–107
- second trading period 63, 67, 82–4,  
113, 123, 128, 150, 156
- secondary market 3, 6, 7, 59, 107, 120,  
121, 147
- separated approach 136–7, 139–40,  
142–3, 155
- Slovakia 92, 115
- Slovenia 91, 92
- SO<sub>2</sub> emissions trading scheme 6, 58,  
59–62, 114  
*see also* acid rain; cap and trade
- social marginal benefit 16, 44, 45–6,  
50–51
- social marginal cost 16, 20, 44, 45–6,  
47, 50–51

- social optimal equilibrium 16, 20–21, 34, 39, 50–51
- Spain 91
- Stern review 17, 18–19, 20
- strict liability 40–42
- subsidy 93, 100, 106, 111, 117–19, 150
  - see also* cross-subsidization; lump-sum subsidy
- surplus of allowances 51, 75–6, 79
  - see also* over-allocation
- Sweden 61, 91
- tax 36–7, 45–8, 52, 53–4, 55–7, 112–13, 146
- technology 11–13, 16–17, 22, 44, 46–7, 52, 55–6, 68–9, 71, 76, 107, 110, 151
- third trading period 4, 62, 122, 127–8, 130, 139, 142, 152
- tradable permits 3, 48, 49–50, 52–3, 54, 56, 65, 75, 94, 107, 110, 117, 118, 146, 151
- trade exposure 136, 139, 142
- trade intensity 135–8, 142, 144
- tragedy of the commons 33–4
- transaction costs 34, 44, 48–9, 65, 110, 124, 125, 127, 151, 153
- uncertainty
  - and economic instruments 52
  - and economy 13–14, 22, 26
  - and emissions 13–15, 22, 42, 45, 52, 64
  - and regulation 67, 124, 126, 149
- unilateral accident 40, 41, 42
- United Kingdom (UK) 59, 91, 92
- United Nations Conference on Environment and Development 26
- United Nations Conference on the Human Environment 25
- United Nations Environment Programme 10
- United Nation Framework Convention on Climate Change (UNFCCC) 10, 26–7, 28–9
- United States (US) 5, 32
- verified emissions 75–6, 82, 140
- Weitzman M. L. 52, 54
- windfall profits 100, 107, 113, 116, 150
  - see also* pass through
- World Energy Outlook (WEO) 14, 18
- World Meteorological Organization 11
- World Resource Institute 11









