ECONOMICS OF NATURAL RESOURCES AND THE ENVIRONMENT

David W. Pearce and R. Kerry Turner



The Johns Hopkins University Press Baltimore

CONTENTS

Preface and Acknowledgements		хi
PAR	RT I: ECONOMY AND ENVIRONMENT	
Cha	pter 1 The Historical Development of Environmental	
	Economics	3
_1.1	Introduction	3
1.2	Early Economic Paradigms and the Environment	4
1.3	Post-War Economics and the Rise of Environmentalism	12
1.4	Institutional Economics Paradigm	15
1.5	The Market Model of Environmental Management	16
1.6	Policy Analysis: Fixed Standard versus Cost-Benefit	
	Framework	20
1.7	Economic and Environmental Values	21
1.8	Sustainable Economic Growth and Development	23
1.9	Ecological and Co-evolutionary Economic Paradigm	25
1.10	Conclusions	26
Cha	pter 2 The Circular Economy	29
2.1	Narrow and Holistic Views of Economies and	
	Environments	29
2.2	The Environment-Economy Interaction	31
2.3	The Circular Economy	35
2.4	Existence Theorems	41
Cha	pter 3 The Sustainable Economy	43
3.1	Rules for Sustaining Closed Economies	43
3.2		44
3.3	Maintaining the Natural Capital Stock	48
3.4	The Meaning of Constant Capital Stock	52
3.5	Existing and Optimal Capital Stocks	53

PART II: THE ECONOMICS OF POLLUTION

Cha	pter 4 The Optimal Level of Pollution	61
4.1	Pollution as Externality	61
4.2	Optimal Externality	62
4.3	Alternative Definitions of Pollution	64
4.4	Types of Externality	66
4.5	Who are the Polluters?	67
4.6	Conclusions	67
App	pendix 4.1 Deriving a Marginal Net Private Benefit Curve	69
Cha	pter 5 The Market Achievement of Optimal Pollution	70
5.1	Property Rights	70
5.2	The Potential for Market Bargains in Externality	71
5.3	Criticisms of the Coase Theorem	73
App	pendix 5.1 Resurrecting the Coase Theorem under	
	Imperfect Competition	78
App	pendix 5.2 Non-Convexity and the Market Bargain	
	Theorem	79
Cha	pter 6 Taxation and Optimal Pollution	84
6.1	Introduction	84
6.2	The Optimal Pigovian Tax	85
6.3	Illustrating the Optimal Pigovian Tax Mathematically	86
6.4	Pollution Charges and Property Rights	87
6.5	Pollution Charges and Abatement Costs	88
6.6	A Formal Proof that MAC = MEC Produces Optimal	
	Pollution	91
6.7	Pigovian Taxes and Imperfect Competition	9
6.8	Charges as a Low-Cost Solution to Standard Setting	94
6.9	Why are Pollution Taxes not Widespread?	96
App	pendix 6.1 The Emissions-Damage Sequence for an	
	Electricity Power Station	98
App	pendix 6.2 The Target of a Pigovian Tax	100
Cha	pter 7 Environmental Standards, Taxes and Subsidies	102
7.1	The Inefficiency of Standard-Setting	102
	Taxes versus Standards	104
73	Pollution Reduction Subsidies	107

		CONTENTS	vii
Cha	pter 8 Marketable Pollution Permits		110
8.1	Theory of Marketable Permits		110
8.2	The Advantages of Marketable Permits		111
8.3	Types of Permit Systems		115
8.4	Permit Trading in Practice		117
Cha	pter 9 Measuring Environmental Damage I:		
	Total Economic Value		120
9.1	The Meaning of Environmental Valuation		120
9.2	The Uses of Economic Value		122
9.3	Costs, Benefits, Willingness to Pay and Willingn	ess to	
	Accept		125
9.4	Total Economic Value		129
9.5	Option Value		132
9.6	Existence Value		134
9.7	Empirical Measures of Option and Existence Va	lue	137
Chaj	pter 10 Measuring Environmental Damage II:		
	Valuation Methodologies		141
10.1	Č		141
10.2			142
10.3	* *		143
10.4			148
10.5	± ±		153
10.6	Willingness to Pay versus Willingness to Accep	t	156
Chaj	pter 11 Pollution-Control Policy in Mixed Econ	ıomies	159
11.1	•		159
11.2	Direct Regulations: A 'Command and Control'	•	
	Philosophy		161
11.3	Technology-Based Pollution Control Strategies	: The USA	
	and the UK		162
11.4	EEC Pollution-Control Policy		167
11.5	Integrated Pollution-Control: The UK BPEO C	Concept	169
11.6	Economic Incentive Pollution-Control Instrum	ents	171
Chaj	pter 12 Pollution-Control in Centrally-Planned		
	Economies		177

12.1 Soviet Ideology and Environmental Image

viii contents

12.2	Economic Self-Sufficiency and the Transformation of Nature	180
12.3		100
12.5	Controversy .	182
12.4	•	185
Chap	oter 13 Global Pollution Policy	19
13.1	Introduction	19
13.2	Acid Rain	192
	Chlorofluorocarbons	197
13.4	Carbon Dioxide and the Greenhouse Effect	20
PAR	T III: ETHICS AND FUTURE GENERATIONS	209
	oter 14 Discounting the Future	21
14.1		21
14.2	U	212
14.3	1	21′
	Problems with the Critique of Discounting	223
14.5	An Alternative to Adjusting Discount Rates	224
Chap	oter 15 Environmental Ethics	220
15.1	Environmental Values Environmental Ethics and Species Preservation	220
15.2	Environmental Ethics and Species Preservation	228
15.3	The Search for a New Environmental Ethic	23
PAR	T IV: THE ECONOMICS OF NATURAL RESOURCES	239
Chap	oter 16 Renewable Resources	24
16.1	Introduction	24
16.2	Growth Curves	242
16.3	The Rate of Exploitation	244
	Costs and Revenues	245
	Preservation Value	25
		254
16.7	•	
		256
16.8	Implications of the More Complete Model	259

Chap	ter 17 The Extinction of Species	262
17.1	The Problem of Extinction	262
17.2	Open Access and Species Extinction	266
17.3	Profit Maximisation and Extinction	268
17.4	Why Does Extinction Occur?	269
Chap	ter 18 Exhaustible Resources	271
18.1	Introduction	271
18.2	The Fundamental Principle of Exhaustible Resource Use	271
18.3	A Diagrammatic Exposition of Optimal Resource Use	273
18.4	Resource Prices and Backstop Technology	276
18.5	The Effects of Changing Parameters	278
18.6	Monopoly and the Rate of Extraction	284
18.7	Summarising the Optimal Use and Depletion Rules	287
Chap	ter 19 Measuring and Mitigating Natural Resource	
-	Scarcity	288
19.1	Introduction: Malthusian and Ricardian Scarcity	
	Recognition	288
19.2	Empirical Evidence on Resource Price Paths	290
19.3	A Typology of Scarcity and Price/Cost Scarcity Indices	295
19.4	Geochemical and Stock Pollution Constraints on	
	Resource Exploitation	301
19.5	Resource Scarcity Mitigation: Recyling and Substitution	302
19.6	Substitution Processes	306
DA D	THE DEVELOPMENT AND ENVIRONMENT	200
PAK	T V: DEVELOPMENT AND ENVIRONMENT	309
Chap	ter 20 Development, Preservation and Conservation	311
20.1	Conservation and Preservation	311
20.2	Development and Total Economic Value	312
20.3	Irreversibility and the Krutilla-Fisher Algorithm	314
20.4	Safe Minimum Standards	317
20.5	Irreversibility and Sustainability	319
Chap	ter 21 A Case Study of Wetlands	320
21.1	Introduction	320
21.2	Social Inefficiency in Wetland Resource Use	321
21.3	•	322

X CONTENTS

21.4	Total Economic Value of Wetlands	323
21.5	Sources of Inefficiency in Wetland Resource Use:	
	Market and Intervention Failure	324
21.6	Methodologies for the Measurement of	
	Wetland Use Inefficiency	326
21.7	Mechanisms for Social Cost Internalisation	335
Chap	oter 22 Environment and the Developing Countries	342
22.1	The Problem	342
22.2	The Dependence on Natural Resources	344
22.3	Resource Interconnections	347
22.4	The Economic Cost of Resource Damage	349
22.5	Economic Incentives and Natural Resource	
	Management Policy	352
22.6	Concluding Note	358
Refe	rences and Further Reading	361
Index	S	374