Contents

	PART 1 INTRODUCTION 3	
1	Between Choices and Constraints	ï
	In the beginning • Problems • Themes of the book • How the book is organized • Numbers and the Law of Information	
	PART 2 PAST HUMAN POPULATION GROWTH 23	
2	Four Evolutions in Population Growth 25	ī
	Population growth is less like it used to be than it ever has been before • An overview of four evolutions in human population growth	
3	People Control the Growth of Nonhuman Populations 32	,
	The local agricultural evolution: 8000 B.C4000 B.C. • The global agricultural evolution: 1650-1850	
4	People Control the Growth of Human Populations 46	5
	The demographic transition • The public health evolution: 1945-now • The fertility evolution: 1785-? • Unintended effects: the Law of Action	
5	Human Population History in Numbers and Graphs 76	5
	Quantitative estimates of population size and growth rates Did the global population growth rate increase at each evolution? A picture album of human population growth	
5	The Uniqueness of the Present Relative to the Past 97	7
	Aging • The command of energy • Urbanization • Mixing • Ten thousand years: a glance backward and forward	
	PART 3 FUTURE HUMAN POPULATION GROWTH 107	
7	Projection Methods: The Hazy Crystal Ball 109)
	The future is unlike the past because it has not happened yet • Mathematical extrapolations • The cohort-component method • Stochastic population projection • System models • How successful have past projections been? • Confidence: the Law of Prediction	

8	Scenarios of Future Population	136
	Constant fertility • Instantaneous replacement-level fertility • Sensitivity analyses by the United Nations • Other long-term projections • Will today's poor countries experience a fertility transition?	
9	What Do We Know for Sure about the Future of Global Population?	153
	Uncertainty • Zero population growth • Momentum • Methuselah's choice	
	PART 4 THE HUMAN CARRYING CAPACITY OF THE EARTH 159	
10	Eight Estimates of Human Carrying Capacity	161
	"Lands of the globe still available for European settlement" (1891) • "The chief problem of physical anthropogeography" (1925) • "The potential productivity of Earth and the population it could support" (1967) • "Optimum world population" (1970) • "The resources available for agriculture" (1976) • "Population growth and land use" (1977) • "Potential population supporting capacities of lands in the developing world" (1983) • "The population potentially supported by the primary food supply" (1991)	
11	Estimates of Human Carrying Capacity: A Survey of Four Centuries	212
	Estimates of global human carrying capacity: levels • Estimates of human carrying capacity: methods • Local estimates of human carrying capacity • Verbal definitions of human carrying capacity • Conclusions	
12	Carrying Capacity in Ecology and Applied Ecology	237
	Concepts of carrying capacity in basic ecology • Concepts of carrying capacity in applied ecology • Can ecological concepts of carrying capacity serve for humans?	
13	Human Choices	261
	Typical level of material well-being • Distribution of material well-being • Technology • Domestic and international political institutions • Domestic and international economic arrangements • Domestic and international demographic arrangements • Physical, chemical and biological environments • Variability or stability • Risk or robustness • Time horizon • Fashions,	

14	Water: A Case Study of Natural Constraints	297
	How much water is available? • How much water is required? • How many people can the Earth's water support? • How does water connect with other constraints? • Is water a limiting factor for human population? • How could radical developments affect water supplies? • Freshwater overview	
5	Natural Constraints and Time	329
	How can natural constraints be organized? • A tale of time • Time constraints in energy • Time constraints in agriculture • Time constraints in mineral resources • Time constraints in biological diversity • Time constraints in infectious disease: "Will AIDS solve the population problem?" • Time constraints in population growth • Natural constraints, time, ingenuity, and organizational complexity	
6	Human Carrying Capacity: An Overview	356
	Case study: Easter Island • Living in the land of lost illusions: human carrying capacity as an indicator • Beyond equilibrium	
	PART 5 CONCLUSION: HUMAN CARING CAPACITY 365	
7	Entering the Zone	367
	Recapitulation • Dealing with population problems: bigger pie; fewer forks; better manners • How to slow human population growth • Questions	
8	Looking Beyond the Next Hill: Some Suggestions	380
	Institutions to reconcile efficiency and equality • Accounting • Research on population, culture, economics and environment • Mutual aid • Improving the art of living	
	Appendices 399	
	Conversion ratios	399
2	Estimates of past human population sizes (millions)	400
3	Estimates of how many people the Earth can support (in chronological order)	402
1	Verbal definitions of human carrying capacity (in chronological order)	419
5	Human daily dietary energy: biological requirements and socioeconomic demand	426

6 Mathematical cartoons of human population size and carrying capacity

429

Adult entertainment • The limit of Malthus meets the progress of Condorcet • Continuous-time model of Malthus and Condorcet • Discrete-time model of Malthus and Condorcet • Malthus and Condorcet meet John Stuart Mill • Morals of the story

Notes 447

BIBLIOGRAPHY 481

SELECTED REFERENCES 481

REFERENCES 481

ACKNOWLEDGMENTS 505

INDEX 507