

Vaclav Smil

Enriching the Earth

Fritz Haber, Carl Bosch,
and the Transformation
of World Food Production

Enriching The Earth Fritz Haber Carl Bosch And The Transformation Of World Food Production

Jeffrey M. Pilcher



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Enriching the Earth Vaclav Smil, 2004-02-27 Dr Smil is the world's authority on nitrogenous fertilizer. The industrial synthesis of ammonia from nitrogen and hydrogen has been of greater fundamental importance to the modern world than the invention of the airplane, nuclear energy, space flight, or television. The expansion of the world's population from 1.6 billion people in 1900 to today's six billion would not have been possible without the synthesis of ammonia. In *Enriching the Earth*, Vaclav Smil begins with a discussion of nitrogen's unique status in the biosphere, its role in crop production, and traditional means of supplying the nutrient. He then looks at various attempts to expand natural nitrogen flows through mineral and synthetic fertilizers. The core of the book is a detailed narrative of the discovery of ammonia synthesis by Fritz Haber, a discovery scientists had sought for over one hundred years, and its commercialization by Carl Bosch and the chemical company BASF. Smil also examines the emergence of the large-scale nitrogen fertilizer industry and analyzes the extent of global dependence on the Haber-Bosch process and its biospheric consequences. Finally, it looks at the role of nitrogen in civilization and, in a sad coda, describes the lives of Fritz Haber and Carl Bosch after the discovery of ammonia synthesis.

Enriching the Earth Vaclav Smil, 2001 *Feeding the World* Vaclav Smil, 2001-08-24 A realistic yet encouraging look at how society can change in ways that will allow us to feed an expanding global population. This book addresses the question of how we can best feed the ten billion or so people who will likely inhabit the Earth by the middle of the twenty-first century. He asks whether human ingenuity can produce enough food to support healthy and vigorous lives for all these people without irreparably damaging the integrity of the biosphere. What makes this book different from other books on the world food situation is its consideration of the complete food cycle from agriculture to post-harvest losses and processing to eating and discarding. Taking a scientific approach, Smil espouses neither the catastrophic view that widespread starvation is imminent nor the cornucopian view that welcomes large population increases as the source of endless human inventiveness. He shows how we can make more effective use of current resources and suggests that if we increase farming efficiency, reduce waste, and transform our diets, future needs may not be as great as we anticipate. Smil's message is that the prospects may not be as bright as we would like, but the outlook is hardly disheartening. Although inaction, late action, or misplaced emphasis may bring future troubles, we have the tools to steer a more efficient course. There are no insurmountable biophysical reasons we cannot feed humanity in the decades to come while easing the burden that modern agriculture puts on the biosphere.

Environmental Transformations Mark Whitehead, 2014-04-16 From the depths of the oceans to the highest reaches of the atmosphere, the human impact on the environment is significant and undeniable. These forms of global and local environmental change collectively appear to signal the arrival of a new geological epoch, the Anthropocene. This is a geological era defined not by natural environmental fluctuations or meteorite impacts but by collective actions of humanity. *Environmental Transformations* offers a concise and accessible introduction to the human practices and systems that sustain

the Anthropocene It combines accounts of the carbon cycle global heat balances entropy hydrology forest ecology and pedology with theories of demography war industrial capitalism urban development state theory and behavioural psychology This book charts the particular role of geography and geographers in studying environmental change and its human drivers It provides a review of critical theories that can help to uncover the socio economic and political factors that influence environmental change It also explores key issues in contemporary environmental studies such as resource use water scarcity climate change industrial pollution and deforestation These issues are mapped through a series of geographical case studies to illustrate the particular value of geographical notions of space place and scale in uncovering the complex nature of environmental change in different socio economic political and cultural contexts Finally the book considers the different ways in which nations communities and individuals around the world are adapting to environmental change in the twenty first century Particular attention is given throughout to the uneven geographical opportunities that different communities have to adapt to environmental change and to the questions of social justice this situation raises This book encourages students to engage in the scientific uncertainties that surround the study of environmental change while also discussing both pessimistic and more optimistic views on the ability of humanity to address the environmental challenges of our current era

Food, Animals, and the Environment Christopher Schlottmann, Jeff Sebo, 2018-09-14 Food Animals and the Environment An Ethical Approach examines some of the main impacts that agriculture has on humans nonhumans and the environment as well as some of the main questions that these impacts raise for the ethics of food production consumption and activism Agriculture is having a lasting effect on this planet Some forms of agriculture are especially harmful For example industrial animal agriculture kills 100 billion animals per year consumes vast amounts of land water and energy and produces vast amounts of waste pollution and greenhouse gas emissions Other forms such as local organic and plant based food have many benefits but they also have many costs especially at scale These impacts raise difficult ethical questions What do we owe animals plants species and ecosystems What do we owe people in other nations and future generations What are the ethics of risk uncertainty and collective harm What is the meaning and value of natural food in a world reshaped by human activity What are the ethics of supporting harmful industries when less harmful alternatives are available What are the ethics of resisting harmful industries through activism advocacy and philanthropy The discussion ranges over cutting edge topics such as effective altruism abolition and regulation revolution and reform individual and structural change single issue and multi issue activism and legal and illegal activism This unique and accessible text is ideal for teachers students and anyone else interested in serious examination of one of the most complex and important moral problems of our time

Transforming the Twentieth Century Vaclav Smil, 2006-04-13 This inquiry into the technical advances that shaped the 20th century follows the evolutions of all the principal innovations introduced before 1913 as detailed in the first volume as well as the origins and elaborations of all fundamental 20th century advances The history of the 20th century is rooted in amazing

technical advances of 1871 1913 but the century differs so remarkably from the preceding 100 years because of several unprecedented combinations The 20th century had followed on the path defined during the half century preceding the beginning of World War I but it has traveled along that path at a very different pace with different ambitions and intents The new century's developments elevated both the magnitudes of output and the spatial distribution of mass industrial production and to new and in many ways virtually incomparable levels Twentieth century science and engineering conquered and perfected a number of fundamental challenges which remained unresolved before 1913 and which to many critics appeared insoluble This book is organized in topical chapters dealing with electricity engines materials and syntheses and information techniques It concludes with an extended examination of contradictory consequences of our admirable technical progress by confronting the accomplishments and perils of systems that brought liberating simplicity as well as overwhelming complexity that created unprecedented affluence and equally unprecedented economic gaps that greatly increased both our security and fears as well as our understanding and ignorance and that provided the means for greater protection of the biosphere while concurrently undermining some of the key biophysical foundations of life on Earth Transforming the Twentieth Century will offer a wide ranging interdisciplinary appreciation of the undeniable technical foundations of the modern world as well as a multitude of welcome and worrisome consequences of these developments It will combine scientific rigor with accessible writing thoroughly illustrated by a large number of appropriate images that will include historical photographs and revealing charts of long term trends **Shrinking the Earth** Donald

Worster, 2016-01-08 The discovery of the Americas around 1500 AD was an extraordinary watershed in human experience It gave rise to the modern period of human ecology a phenomenon global in scope that set in motion profound changes in almost every society on earth This new period which saw the depletion of the lands of the New World proved tragic for some triumphant for others and powerfully affecting for all In this work acclaimed environmental historian Donald Worster takes a global view in his examination of the ways in which complex issues of worldwide abundance and scarcity have shaped American society and behavior over three centuries Looking at the limits nature imposes on human ambitions he questions whether America today is in the midst of a shift from a culture of abundance to a culture of limits and whether American consumption has become reliant on the global South Worster engages with key political economic and environmental thinkers while presenting his own interpretation of the role of capitalism and government in issues of wealth abundance and scarcity Acknowledging the earth's agency throughout human history Shrinking the Earth offers a compelling explanation of how we have arrived where we are and a hopeful way forward on a planet that is no longer as large as it once was The Domination of Nature William Leiss, 2023-02-15 Concern over ecological and environmental problems grows daily and many believe we're at a critical tipping point Scientists social thinkers public officials and the public recognize that failure to understand the destructive impact of industrial society and advanced technologies on the delicate balance of organic life in

the global ecosystem will result in devastating problems for future generations In *The Domination of Nature* William Leiss argues that this global predicament must be understood in terms of deeply rooted attitudes towards nature He traces the origins development and social consequences of an idea whose imprint is everywhere in modern thought the idea of the domination of nature In part 1 Leiss traces the idea of the domination of nature from the Renaissance to the nineteenth century Francis Bacon s seminal work provides the pivotal point for this discussion and through an original interpretation of Bacon s thought Leiss shows how momentous ambiguities in the idea were incorporated into modern thought By the beginning of the twentieth century the concept had become firmly identified with scientific and technological progress This fact defines the task of part 2 Using important contributions by European sociologists and philosophers Leiss critically analyzes the role of science and technology in the modern world In the concluding chapter he puts the idea of mastery over nature into historical perspective and explores a new approach based on the possibilities of the liberation of nature Originally published in 1972 *The Domination of Nature* was part of the first wave of widespread interest in environmental issues In a new preface Leiss explores the concept of eco dominion and the moral obligations of human citizens of the twenty first century

Handbook of the Anthropocene Nathanaël Wallenhorst, Christoph Wulf, 2023-08-21 This Handbook is a collection of contributions of more than 300 researchers who have worked to grasp the Anthropocene this new geological epoch characterised by a modification of the conditions of habitability of the Earth for all living things in its biogeophysical and socio political reality These researchers also sought to define a historical and prospective anthropology that integrates social economic cultural and political issues as well as of course environmental ones What are the anthropological changes needed to ensure that our human adventure will be able to continue in the Anthropocene And what are the educational and political issues involved Anthropocene is fast becoming a widely used term but thus far there been no reference work explaining the thoughts of the greatest experts of the present day on this subject at the intersection of biogeophysical and socio political knowledge A scientific and political concept but which is also the conceptual vehicle for conveying the scientific community s sense of concern this complex term is explained by international experts as they reflect on scientific arguments taking place in earth system science the social sciences and the humanities What these researchers from different disciplines have in common is a healthy concern for the future and how to prepare for it in the Anthropocene and also the identification of possible anthropological changes This Handbook encourages readers to immerse themselves in reflections on the human adventure through descriptions of our differing heritages and the future that is in the process of being written

Food Security Bryan L. McDonald, 2010-12-28 Despite great global effort events of the early 21st century clearly demonstrate that food remains a pressing challenge which has significant implications for security This book provides a detailed and comprehensive introduction to the major issues impacting global food security today *Livestock's Long Shadow* Henning Steinfeld, Pierre Gerber, T. D. Wassenaar, Food and Agriculture Organization of the United Nations, Vincent

Castel, Cees de Haan, 2006-01-01 And conclusions fra rapporten **A Cultural History of Food in the Modern Age** Amy Bentley, 2014-05-22 In the modern age 1920 2000 vast technological innovation spurred greater concentration standardization and globalization of the food supply As advances in agricultural production in the post World War II era propelled population growth a significant portion of the population gained access to cheap industrially produced food while significant numbers remained mired in hunger and malnutrition Further as globalization allowed unprecedented access to foods from all parts of the globe it also hastened environmental degradation contributed to poor health and remained a key element in global politics economics and culture A Cultural History of Food in the Modern Age presents an overview of the period with essays on food production food systems food security safety and crises food and politics eating out professional cooking kitchens and service work family and domesticity body and soul representations of food and developments in food production and consumption globally Wheat Mike J. Gooding, Peter R. Shewry, 2022-01-27 Wheat is produced on a greater area grown over a wider geographic range and traded internationally as a commodity more than any other arable crop Wheat alone provides 20% of the calories and protein in the global human diet Understanding the interactions between wheat production the environment and human nutrition is essential for meeting the demands of food security as we approach the middle of the 21st century Wheat Environment Food and Health is written by two leading authorities in the field and offers insights into critical issues such as the sustainability of wheat production the challenges of both mitigating and adapting to environmental change and the effects of wheat consumption on human health Covering a broad range of topics the authors Introduce the historical development and utilization of the wheat crop Describe the factors affecting the quality and acceptability of wheat for different uses Discuss the soil characteristics that are required for and changed by wheat production Examine the water temperature and light requirements of wheat systems Explore the methods and sustainability of plant breeding and farmer approaches to improving crop yields Describe the development structure and composition of wheat grain Discuss the contribution and impacts both positive and negative of wheat consumption on human health Discuss how modern technologies and new approaches are addressing the challenges of maintaining wheat production Wheat Environment Food and Health is an essential resource for researchers and academics in disciplines including agriculture plant biology applied biology botany food science and nutrition crop improvement food security environmental sustainability and human health Green Meat? Ryan M. Katz-Rosene, Sarah J. Martin, 2020-04-16 Green Meat takes a multifaceted approach to the issues of industrialized agricultural production and its relationship to climate change It argues that one singular solution to this problem would undermine the myriad of ways that meat is consumed across regional and cultural lines Although meat may always be a global staple of the human diet it is not too late to re examine current food systems through the framework of sustainability and ecological prosperity Alternatives Journal The Oxford Handbook of Food History Jeffrey M. Pilcher, 2012-11-08 The final chapter in this section explores the uses of food in the classroom The God

Species Mark Lynas, 2011-10-04 We humans are the God species both the creators and destroyers of life on this planet As we enter a new geological era the Anthropocene our collective power now overwhelms and dominates the major forces of nature But from the water cycle to the circulation of nitrogen and carbon through the entire Earth system we are coming dangerously close to destroying the planetary life support systems that sustain us In this controversial new book Royal Society Science Books Prize winner Mark Lynas shows us how we must use our new mastery over nature to save the planet from ourselves Taking forward the work of a brilliant new group of Earth system scientists who have mapped out our real planetary boundaries Lynas draws up a radical manifesto calling for the increased use of environmentally friendly technologies like genetic engineering and nuclear power as part of a global effort to use humanity's best tools to protect and nurture the biosphere Ecological limits are real but economic limits are not Lynas contends We can and must feed a richer population of nine billion people in decades to come whilst also respecting the nine planetary boundaries from biodiversity to ocean acidification now identified and quantified by scientists Ripping up years of environmental orthodoxy he reveals how the prescriptions of the current green movement are likely to hinder as much as help our vitally needed effort to use science and technology to play God and save the planet *Sustainable Phosphorus Management* Roland W. Scholz, Amit H.

Roy, Fridolin S. Brand, Deborah T. Hellums, Andrea E. Ulrich, 2014-03-12 This book describes a pathway for sustainable phosphorus management via the Global Transdisciplinary Processes for Sustainable Phosphorus Management project Global TraPs Global TraPs is a multi stakeholder forum in which scientists from a variety of disciplines join with key actors in practice to jointly identify critical questions and to articulate what new knowledge technologies and policy processes are needed to ensure that future phosphorus use is sustainable improves food security and environmental quality and provides benefits for the poor The book offers insight into economic scarcity and identifies options to improve efficiency and reduce environmental impacts of anthropogenic phosphorus flows at all stages of the supply and use chain **Global Innovation,**

Finance, and International Commerce F. John Mathis, Raja M. Almarzoqi, 2022-12-12 This book analyses the historical context and progression of significant innovations beginning with the industrial revolution starting around 1750 to the present It explores the interrelationship causes and evolutionary process of contemporary disruptive inventions and the role played by global finance and international commerce to support these First the authors examine the environment and circumstances surrounding the inventors and explore their backgrounds to determine why at a specific time they identified a need that became the seed for invention and what was their method of successfully commercializing their innovation Secondly they focus on the financing of the inventor the innovation and the commercialization of the invention's They analyze the changes in finance during the shift from a labor based production process to a more capital intensive production process and what new financial products or financial markets were created to facilitate this transition Third they explore the impact of global commerce on the inventor country's innovation environment and international competition impacting the innovation

s production distribution and sales as well as investigating any financial impact from the demand side and whether that impact was domestic or global in character Furthermore they consider if and how global finance and international commerce including the migration of people together play a role in helping the disruptive invention satisfy a need in society whether from a production or consumption perspective Finally they search for common elements that repeatedly inspired inventors and their disruptive innovations over time This book will appeal to global government officials business leadership early career professionals and students across a number of disciplines including finance economics business engineering and technology

Food Security, Agricultural Policies and Economic Growth Niek Koning, 2017-04-21 Using a political economic approach supplemented with insights from human ecology this volume analyzes the long term dynamics of food security and economic growth The book begins by discussing the nature of preindustrial food crises and the changes that have occurred since the 19th century with the ascent of technical science and the fossil fuel revolution It explains how these changes improved living standards but that the realization of this improvement was usually dependent on government support for smallholder modernization The author sets out how the evolution of food security in different regions has been influenced by farm policy choices and how these choices were shaped by local societal characteristics international relations and changing configurations in metropolitan countries Separate chapters are devoted to the interaction of this evolution with debates on food security and economic growth and with international economic policies The final chapters highlight the new challenges for global food security that will arise as traditional sources of biomass production and the more easily extractable reserves of fossil biomass become depleted or can no longer be used Overall the book emphasizes the inadequacy of current explanations with regard to these challenges It explores what is needed to ensure a sustainable future and calls for a rethinking of these issues a necessary reflection in today s unstable global political situation

Geomorphology and Global Environmental Change Olav Slaymaker, Tom Spencer, Christine Embleton-Hamann, 2009-07-02 A statement from the world s leading geomorphologists on the state of and potential changes to the environment

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