

# Making The Modern World Materials And Dematerialization Vaclav Smil

## Shortcut Edition

**Making the Modern World** Vaclav Smil, 2013-12-16 How much further should the affluent world push its material consumption? Does relative dematerialization lead to absolute decline in demand for materials? These and many other questions are discussed and answered in *Making the Modern World: Materials and Dematerialization*. Over the course of time, the modern world has become dependent on unprecedented flows of materials. Now even the most efficient production processes and the highest practical rates of recycling may not be enough to result in dematerialization rates that would be high enough to negate the rising demand for materials generated by continuing population growth and rising standards of living. This book explores the costs of this dependence and the potential for substantial dematerialization of modern economies. *Making the Modern World: Materials and Dematerialization* considers the principal materials used throughout history, from wood and stone, through to metals, alloys, plastics and silicon, describing their extraction and production as well as their dominant applications. The evolving productivities of material extraction, processing, synthesis, finishing and distribution, and the energy costs and environmental impact of rising material consumption are examined in detail. The book concludes with an outlook for the future, discussing the prospects for dematerialization and potential constraints on materials. This interdisciplinary text provides useful perspectives for readers with backgrounds including resource economics, environmental studies, energy analysis, mineral geology, industrial organization, manufacturing and material science.

*Making the Modern World* Vaclav Smil, 2013-10-02 How much further should the affluent world push its material consumption? Does relative dematerialization lead to absolute decline in demand for materials? These and many other questions are discussed and answered in *Making the Modern World: Materials and Dematerialization*. Over the course of time, the modern world has become dependent on unprecedented flows of materials. Now even the most efficient production processes and the highest practical rates of recycling may not be enough to result in dematerialization rates that would be high enough to negate the rising demand for materials generated by continuing population growth and rising standards of living. This book explores the costs of this dependence and the potential for substantial dematerialization of modern

economies. *Making the Modern World: Materials and Dematerialization* considers the principal materials used throughout history, from wood and stone, through to metals, alloys, plastics and silicon, describing their extraction and production as well as their dominant applications. The evolving productivities of material extraction, processing, synthesis, finishing and distribution, and the energy costs and environmental impact of rising material consumption are examined in detail. The book concludes with an outlook for the future, discussing the prospects for dematerialization and potential constraints on materials. This interdisciplinary text provides useful perspectives for readers with backgrounds including resource economics, environmental studies, energy analysis, mineral geology, industrial organization, manufacturing and material science.

**Materials and Dematerialization** Vaclav Smil, 2023-06-26 MATERIALS AND DEMATERIALIZATION World-renowned scientist Vaclav Smil examines a critical topic in the research and policy domain of sustainable resource use. Over the course of time, the modern world has become dependent on unprecedented flows of materials. Now even the most efficient production processes and the highest practical rates of recycling may not be enough to result in dematerialization rates that would be high enough to negate the rising demand for materials generated by continuing population growth and rising standards of living. *Materials and Dematerialization* considers the principal materials used throughout history, from wood and stone, through to metals, alloys, plastics and silicon, describing their extraction and production as well as their dominant applications. The evolving productivities of material extraction, processing, synthesis, finishing and distribution, and the energy costs and environmental impact of rising material consumption are examined in detail, along with the relationship between socio-economic development and resource use, including major technological and innovation aspects. The book concludes with an outlook for the future, discussing the prospects for dematerialization, potential constraints on materials, and an updated appraisal of material requirements and prospects during the coming decades. Building on the success of his 2013 book, Vaclav Smil has thoroughly revised this landmark text to highlight advances that have taken place over the last decade, including a thorough review of statistics and references to 2022. This updated edition also includes new content to explicitly address material for global energy transition and for securing food for a still growing global population. Praise for the 1st edition "Vaclav Smil keeps turning out amazing books. *Making the Modern World*, I just finished, and it's pretty fantastic." (Interview with Bill Gates, January 2014)

**SUMMARY** Edition Shortcut (author), 1901

*SUMMARY - Making The Modern World: Materials And Dematerialization By Vaclav Smil* Shortcut Edition, \* Our summary is short, simple and pragmatic. It allows you to have the essential ideas of a big book in less than 30 minutes. As you read this summary, you will learn that the increased consumption of materials is the major feature of the modern world. You will also learn that : the invention of the steam engine revolutionized mankind; a long-term dematerialization without

radical changes in lifestyle is very unlikely; humanity's material progress is experiencing two successive ages; energy is the most important of all materials; our civilization is at a crossroads in terms of our consumption of materials; the current level of material consumption is very recent if we place it in the long historical period. The consumption of materials is at the heart of economic production, without which it could not exist. Materials of all kinds, be they mineral, vegetable, etc., condition our daily life, modern life, that of industrialized countries whose societies are consumer societies. Their production, use and destruction, once they have become waste, are the subject of this book, which examines the costs of our society's dependence on materials, as well as the possible paths to a progressive dematerialization, which the threatened integrity of the biosphere makes indispensable. \*Buy now the summary of this book for the modest price of a cup of coffee!

Still the Iron Age Vaclav Smil, 2016-01-22 Although the last two generations have seen an enormous amount of attention paid to advances in electronics, the fact remains that high-income, high-energy societies could thrive without microchips, etc., but, by contrast, could not exist without steel. Because of the importance of this material to contemporary civilization, a comprehensive resource is needed for metallurgists, non-metallurgists, and anyone with a background in environmental studies, industry, manufacturing, and history, seeking a broader understanding of the history of iron and steel and its current and future impact on society. Given its coverage of the history of iron and steel from its genesis to slow pre-industrial progress, revolutionary advances during the 19th century, magnification of 19th century advances during the past five generations, patterns of modern steel production, the ubiquitous uses of the material, potential substitutions, advances in relative dematerialization, and appraisal of steel's possible futures, *Still the Iron Age: Iron and Steel in the Modern World* by world-renowned author Vaclav Smil meets that need. - Incorporates an interdisciplinary discussion of the history and evolution of the iron- and steel-making industry and its impact on the development of the modern world - Serves as a valuable contribution because of its unique perspective that compares steel to technological advances in other materials, perceived to be important - Discusses how we can manufacture smarter rather than deny demand - Explores future opportunities and new efforts for sustainable development in the industry

*Global Catastrophes and Trends* Vaclav Smil, 2012-09-14 A wide-ranging, interdisciplinary look at global changes that may occur over the next fifty years—whether sudden and cataclysmic world-changing events or gradually unfolding trends. Fundamental change occurs most often in one of two ways: as a “fatal discontinuity,” a sudden catastrophic event that is potentially world changing, or as a persistent, gradual trend. Global catastrophes include volcanic eruptions, viral pandemics, wars, and large-scale terrorist attacks; trends are demographic, environmental, economic, and political shifts that unfold over time. In this provocative book, scientist Vaclav Smil takes a wide-ranging, interdisciplinary look at the catastrophes and trends the next fifty years may bring. Smil first looks at rare but cataclysmic events, both natural and human-produced, then at trends of global importance, including the transition from fossil fuels to other energy sources and

growing economic and social inequality. He also considers environmental change—in some ways an amalgam of sudden discontinuities and gradual change—and assesses the often misunderstood complexities of global warming. *Global Catastrophes and Trends* does not come down on the side of either doom-and-gloom scenarios or techno-euphoria. Instead, Smil argues that understanding change will help us reverse negative trends and minimize the risk of catastrophe.

Growth Vaclav Smil, 2019-09-24 A systematic investigation of growth in nature and society, from tiny organisms to the trajectories of empires and civilizations. Growth has been both an unspoken and an explicit aim of our individual and collective striving. It governs the lives of microorganisms and galaxies; it shapes the capabilities of our extraordinarily large brains and the fortunes of our economies. Growth is manifested in annual increments of continental crust, a rising gross domestic product, a child's growth chart, the spread of cancerous cells. In this magisterial book, Vaclav Smil offers systematic investigation of growth in nature and society, from tiny organisms to the trajectories of empires and civilizations. Smil takes readers from bacterial invasions through animal metabolisms to megacities and the global economy. He begins with organisms whose mature sizes range from microscopic to enormous, looking at disease-causing microbes, the cultivation of staple crops, and human growth from infancy to adulthood. He examines the growth of energy conversions and man-made objects that enable economic activities—developments that have been essential to civilization. Finally, he looks at growth in complex systems, beginning with the growth of human populations and proceeding to the growth of cities. He considers the challenges of tracing the growth of empires and civilizations, explaining that we can chart the growth of organisms across individual and evolutionary time, but that the progress of societies and economies, not so linear, encompasses both decline and renewal. The trajectory of modern civilization, driven by competing imperatives of material growth and biospheric limits, Smil tells us, remains uncertain.

**Grand Transitions** Vaclav Smil, 2021-02-12 From one of the world's leading experts on the history of energy, a rigorous examination of the transitions that structure our modern world--and the environmental reckoning that will mark its success or failure. What makes the modern world work? The answer to this deceptively simple question lies in four grand transitions of civilization--in populations, agriculture, energy, and economics--which have transformed the way we live. Societies that have undergone all four transitions emerge into an era of radically different population dynamics, food surpluses (and waste), abundant energy use, and expanding economic opportunities. Simultaneously, in other parts of the world, hundreds of millions remain largely untouched by these developments. Through erudite storytelling, Vaclav Smil investigates the fascinating and complex interactions of these transitions. He argues that the moral imperative to share modernity's benefits has become more acute with increasing economic inequality, but addressing this imbalance would make it exceedingly difficult to implement the changes necessary for the long-term preservation of the environment. Thus, managing the fifth transition--environmental changes from natural-resource depletion, biodiversity loss, and global warming--will determine the

success or eventual failure of the grand transitions that have made the world we live in today.

Life Is What You Make It Peter Buffett, 2011-05-03 From composer, musician, and philanthropist Peter Buffett comes a warm, wise, and inspirational book that asks, Which will you choose: the path of least resistance or the path of potentially greatest satisfaction? You may think that with a last name like his, Buffett has enjoyed a life of endless privilege. But the son of billionaire investor Warren Buffett says that the only real inheritance handed down from his parents was a philosophy: Forge your own path in life. It is a creed that has allowed him to follow his own passions, establish his own identity, and reap his own successes. In *Life Is What You Make It*, Buffett expounds on the strong set of values given to him by his trusting and broadminded mother, his industrious and talented father, and the many life teachers he has met along the way. Today's society, Buffett posits, has begun to replace a work ethic, relishing what you do, with a wealth ethic, honoring the payoff instead of the process. We confuse privilege with material accumulation, character with external validation. Yet, by focusing more on substance and less on reward, we can open doors of opportunity and strive toward a greater sense of fulfillment. In clear and concise terms, Buffett reveals a great truth: Life is random, neither fair nor unfair. From there it becomes easy to recognize the equal dignity and value of every human life—our circumstances may vary but our essences do not. We see that our journey in life rarely follows a straight line but is often met with false starts, crises, and blunders. How we push through and persevere in these challenging moments is where we begin to create the life of our dreams—from discovering our vocations to living out our bliss to giving back to others. Personal and revealing, instructive and intuitive, *Life Is What You Make It* is about transcending your circumstances, taking up the reins of your destiny, and living your life to the fullest.

**The Global Condition** William Hardy McNeill, 2017-02-28 William H. McNeill is known for his ability to portray the grand sweep of history. *The Global Condition* is a classic work for understanding the grand sweep of world history in brief compass. Now with a new foreword by J. R. McNeill, this book brings together two of William Hardy McNeill's popular short books and an essay. *The Human Condition* provides a provocative interpretation of history as a competition of parasites, both biological and human; *The Great Frontier* questions the notion of frontier freedom through an examination of European expansion; the concluding essay speculates on the role of catastrophe in our lives.

*Numbers Don't Lie* Vaclav Smil, 2021-05-04 Vaclav Smil is my favorite author... *Numbers Don't Lie* takes everything that makes his writing great and boils it down into an easy-to-read format. I unabashedly recommend this book to anyone who loves learning.--Bill Gates, GatesNotes From the author of *How the World Really Works*, an essential guide to understanding how numbers reveal the true state of our world--exploring a wide range of topics including energy, the environment, technology, transportation, and food production. Vaclav Smil's mission is to make facts matter. An environmental scientist, policy analyst, and a hugely prolific author, he is Bill Gates' go-to guy for making sense of our world. In *Numbers Don't Lie*, Smil answers questions such as: What's worse for the environment--your car or your phone? How much do the world's cows

weigh (and what does it matter)? And what makes people happy? From data about our societies and populations, through measures of the fuels and foods that energize them, to the impact of transportation and inventions of our modern world--and how all of this affects the planet itself--in *Numbers Don't Lie*, Vaclav Smil takes us on a fact-finding adventure, using surprising statistics and illuminating graphs to challenge conventional thinking. Packed with fascinating information and memorable examples, *Numbers Don't Lie* reveals how the US is leading a rising worldwide trend in chicken consumption, that vaccination yields the best return on investment, and why electric cars aren't as great as we think (yet). Urgent and essential, with a mix of science, history, and wit--all in bite-sized chapters on a broad range of topics--*Numbers Don't Lie* inspires readers to interrogate what they take to be true.

**The Next Fifty Years** John Brockman, 2002-05-14 A brilliant ensemble of the world's most visionary scientists provides twenty-five original never-before-published essays about the advances in science and technology that we may see within our lifetimes. Theoretical physicist and bestselling author Paul Davies examines the likelihood that by the year 2050 we will be able to establish a continuing human presence on Mars. Psychologist Mihaly Csikszentmihalyi investigates the ramifications of engineering high-IQ, genetically happy babies. Psychiatrist Nancy Etcoff explains current research into the creation of emotion-sensing jewelry that could gauge our moods and tell us when to take an anti-depressant pill. And evolutionary biologist Richard Dawkins explores the probability that we will soon be able to obtain a genome printout that predicts our natural end for the same cost as a chest x-ray. (Will we want to read it? And will insurance companies and governments have access to it?) This fascinating and unprecedented book explores not only the practical possibilities of the near future, but also the social and political ramifications of the developments of the strange new world to come. Also includes original essays by: Lee Smolin Martin Rees Ian Stewart Brian Goodwin Marc D. Hauser Alison Gopnik Paul Bloom Geoffrey Miller Robert M. Sapolsky Steven Strogatz Stuart Kauffman John H. Holland Rodney Brooks Peter Atkins Roger C. Schank Jaron Lanier David Gelernter Joseph LeDoux Judith Rich Harris Samuel Barondes Paul W. Ewald

Harvesting the Biosphere Vaclav Smil, 2012-12-21 An interdisciplinary and quantitative account of human claims on the biosphere's stores of living matter, from prehistoric hunting to modern energy production. The biosphere—the Earth's thin layer of life—dates from nearly four billion years ago, when the first simple organisms appeared. Many species have exerted enormous influence on the biosphere's character and productivity, but none has transformed the Earth in so many ways and on such a scale as *Homo sapiens*. In *Harvesting the Biosphere*, Vaclav Smil offers an interdisciplinary and quantitative account of human claims on the biosphere's stores of living matter, from prehistory to the present day. Smil examines all harvests—from prehistoric man's hunting of megafauna to modern crop production—and all uses of harvested biomass, including energy, food, and raw materials. Without harvesting of the biomass, Smil points out, there would be no story of human evolution and advancing civilization; but at the same time, the increasing extent and intensity of present-day biomass

harvests are changing the very foundations of civilization's well-being. In his detailed and comprehensive account, Smil presents the best possible quantifications of past and current global losses in order to assess the evolution and extent of biomass harvests. Drawing on the latest work in disciplines ranging from anthropology to environmental science, Smil offers a valuable long-term, planet-wide perspective on human-caused environmental change.

*Energy and the Wealth of Nations* Charles A.S. Hall, Kent Klitgaard, 2018-03-05 In this updated edition of a groundbreaking text, concepts such as energy return on investment (EROI) provide powerful insights into the real balance sheets that drive our “petroleum economy.” Hall and Klitgaard explore the relation between energy and the wealth explosion of the 20th century, and the interaction of internal limits to growth found in the investment process and rising inequality with the biophysical limits posed by finite energy resources. The authors focus attention on the failure of markets to recognize or efficiently allocate diminishing resources, the economic consequences of peak oil, the high cost and relatively low EROI of finding and exploiting new oil fields, including the much ballyhooed shale plays and oil sands, and whether alternative energy technologies such as wind and solar power can meet the minimum EROI requirements needed to run society as we know it. For the past 150 years, economics has been treated as a social science in which economies are modeled as a circular flow of income between producers and consumers. In this “perpetual motion” of interactions between firms that produce and households that consume, little or no accounting is given of the flow of energy and materials from the environment and back again. In the standard economic model, energy and matter are completely recycled in these transactions, and economic activity is seemingly exempt from the Second Law of Thermodynamics. As we enter the second half of the age of oil, when energy supplies and the environmental impacts of energy production and consumption are likely to constrain economic growth, this exemption should be considered illusory at best. This book is an essential read for all scientists and economists who have recognized the urgent need for a more scientific, empirical, and unified approach to economics in an energy-constrained world, and serves as an ideal teaching text for the growing number of courses, such as the authors’ own, on the role of energy in society.

**Should We Eat Meat?** Vaclav Smil, 2013-03-18 Meat eating is often a contentious subject, whether considering the technical, ethical, environmental, political, or health-related aspects of production and consumption. This book is a wide-ranging and interdisciplinary examination and critique of meat consumption by humans, throughout their evolution and around the world. Setting the scene with a chapter on meat’s role in human evolution and its growing influence during the development of agricultural practices, the book goes on to examine modern production systems, their efficiencies, outputs, and impacts. The major global trends of meat consumption are described in order to find out what part its consumption plays in changing modern diets in countries around the world. The heart of the book addresses the consequences of the massive carnivory of western diets, looking at the inefficiencies of production and at the huge impacts on land, water, and the

atmosphere. Health impacts are also covered, both positive and negative. In conclusion, the author looks forward at his vision of “rational meat eating”, where environmental and health impacts are reduced, animals are treated more humanely, and alternative sources of protein make a higher contribution. *Should We Eat Meat?* is not an ideological tract for or against carnivorousness but rather a careful evaluation of meat's roles in human diets and the environmental and health consequences of its production and consumption. It will be of interest to a wide readership including professionals and academics in food and agricultural production, human health and nutrition, environmental science, and regulatory and policy making bodies around the world.

More from Less Andrew McAfee, 2019-10-08 From the coauthor of the New York Times bestseller *The Second Machine Age*, a paradigm-shifting argument “full of fascinating information and provocative insights” (Publishers Weekly, starred review)—demonstrating that we are increasing prosperity while using fewer natural resources. Throughout history, the only way for humanity to grow was by degrading the Earth: chopping down forests, polluting the air and water, and endlessly using up resources. Since the first Earth Day in 1970, the focus has been on radically changing course: reducing our consumption, tightening our belts, and learning to share and reuse. Is that argument correct? Absolutely not. In *More from Less*, McAfee argues that to solve our ecological problems we should do the opposite of what a decade of conventional wisdom suggests. Rather than reduce and conserve, we should rely on the cost-consciousness built into capitalism and the streamlining miracles of technology to create a more efficient world. America—a large, high-tech country that accounts for about 25% of the global economy—is now generally using less of most resources year after year, even as its economy and population continue to grow. What’s more, the US is polluting the air and water less, emitting fewer greenhouse gases, and replenishing endangered animal populations. And, as McAfee shows, America is not alone. Other countries are also transforming themselves in fundamental ways. What has made this turnabout possible? One thing, primarily: the collaboration between technology and capitalism, although good governance and public awareness have also been critical. McAfee does warn of issues that haven’t been solved, like global warming, overfishing, and communities left behind as capitalism and tech progress race forward. But overall, *More from Less* is a revelatory and “deeply engaging” (Booklist) account of how we’ve stumbled into an unexpectedly better balance with nature—one that holds out the promise of more abundant and greener centuries ahead.

*Energy and Civilization* Vaclav Smil, 2018-11-13 A comprehensive account of how energy has shaped society throughout history, from pre-agricultural foraging societies through today's fossil fuel-driven civilization. I wait for new Smil books the way some people wait for the next 'Star Wars' movie. In his latest book, *Energy and Civilization: A History*, he goes deep and broad to explain how innovations in humans' ability to turn energy into heat, light, and motion have been a driving force behind our cultural and economic progress over the past 10,000 years. —Bill Gates, Gates Notes, Best Books of the Year



Energy is the only universal currency; it is necessary for getting anything done. The conversion of energy on Earth ranges from terra-forming forces of plate tectonics to cumulative erosive effects of raindrops. Life on Earth depends on the photosynthetic conversion of solar energy into plant biomass. Humans have come to rely on many more energy flows—ranging from fossil fuels to photovoltaic generation of electricity—for their civilized existence. In this monumental history, Vaclav Smil provides a comprehensive account of how energy has shaped society, from pre-agricultural foraging societies through today's fossil fuel-driven civilization. Humans are the only species that can systematically harness energies outside their bodies, using the power of their intellect and an enormous variety of artifacts—from the simplest tools to internal combustion engines and nuclear reactors. The epochal transition to fossil fuels affected everything: agriculture, industry, transportation, weapons, communication, economics, urbanization, quality of life, politics, and the environment. Smil describes humanity's energy eras in panoramic and interdisciplinary fashion, offering readers a magisterial overview. This book is an extensively updated and expanded version of Smil's *Energy in World History* (1994). Smil has incorporated an enormous amount of new material, reflecting the dramatic developments in energy studies over the last two decades and his own research over that time.

*How the World Really Works* Vaclav Smil, 2022 We have never had so much information at our fingertips and yet most of us don't know how the world really works. This book explains seven of the most fundamental realities governing our survival and prosperity. From energy and food production, through our material world and its globalization, to risks, our environment and its future, *How the World Really Works* offers a much-needed reality check - because before we can tackle problems effectively, we must understand the facts. In this ambitious and thought-provoking book we see, for example, that globalization isn't inevitable and that our societies have been steadily increasing their dependence on fossil fuels, making their complete and rapid elimination unlikely. Vaclav Smil is neither a pessimist nor an optimist, he is a scientist; he is the world-leading expert on energy and an astonishing polymath. This is his magnum opus and is a continuation of his quest to make facts matter. Drawing on the latest science, including his own fascinating research, and tackling sources of misinformation head on - from Yuval Noah Harari to Noam Chomsky - ultimately Smil answers the most profound question of our age- are we irrevocably doomed or is a brighter utopia ahead?

**Technology and Global Change** Arnulf Grübler, 2003-10-16 This is the first book to comprehensibly describe how technology has shaped society and the environment over the last 200 years. It will be useful for researchers, as a textbook for graduate students, for people engaged in long-term policy planning in industry and government, for environmental activists, and for the wider public interested in history, technology, or environmental issues.

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**Making The Modern World  
Materials And Dematerialization  
Vaclav Smil Introduction**

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