

VITAL SIGNS

2001

The Trends That Are Shaping Our Future

WORLDWATCH INSTITUTE

Janet N. Abramovitz	Lisa Mastny
Lester R. Brown	Ashley Mattoon
Seth Dunn	Anne Platt McGinn
Christopher Flavin	Danielle Nierenberg
Hilary French	Michael Renner
Gary Gardner	David M. Roodman
Brian Halweil	Payal Sampat
Ann Hwang	Molly O. Sheehan
Janet Larsen	John E. Young
Nicholas Lenssen	Linda Starke, <i>Editor</i>



In cooperation with the United Nations Environment Programme

UNEP

W.W. Norton & Company
New York London

Other Norton/Worldwatch Books

State of the World 1984 through 2001 (an annual report on progress toward a sustainable society)
Lester R. Brown et al.

Vital Signs 1992 through 2000 (an annual report on the environmental trends that are shaping our future)
Lester R. Brown et al.

Saving the Planet
Lester R. Brown
Christopher Flavin
Sandra Postel

How Much is Enough?
Alan Thein Durning

Last Oasis
Sandra Postel

Full House
Lester R. Brown
Hal Kane

Power Surge
Christopher Flavin
Nicholas Lenssen

Who Will Feed China?
Lester R. Brown

Tough Choices
Lester R. Brown

Fighting for Survival
Michael Renner

The Natural Wealth of Nations
David Malin Roodman

Life Out of Bounds
Chris Bright

Beyond Malthus
Lester R. Brown
Gary Gardner
Brian Halweil

Pillar of Sand
Sandra Postel

Vanishing Borders
Hilary French

Copyright © 2001 by Worldwatch Institute

All rights reserved

Printed in the United States of America

First Edition

VITAL SIGNS and WORLDWATCH INSTITUTE trademarks are registered in the U.S. Patent and Trademark Office.

The views expressed are those of the authors and do not necessarily represent those of the Worldwatch Institute; of its directors, officers, or staff; of the United Nations Environment Programme; or of any funders.

The text of this book is composed in ITC Berkeley Oldstyle with the display set in Optima

Composition by the Worldwatch Institute; manufacturing by the Haddon Craftsmen, Inc.
Book design by Elizabeth Doherty.

ISBN 0-393-32176-2 (pbk)

W.W. Norton & Company, Inc.
500 Fifth Avenue, New York, NY 10110
W.W. Norton & Company Ltd.
10 Coptic Street, London WC1A 1PU

1234567890

 This book is printed on recycled paper.

**WORLDWATCH INSTITUTE
BOARD OF DIRECTORS**

Lester R. Brown, *Chairman*

Øystein Dahle, *Vice Chairman*

Andrew E. Rice, *Secretary*

Tom Crain, *Treasurer*

Adam Albright

Cathy Crain

Herman Daly

James Dehlsen

Christopher Flavin, *Ex Officio*

Lynne Gallagher

Hazel Henderson

Hunter Lewis

Scott McVay

Izaak van Melle

Larry Minear

Wren Wirth

WORLDWATCH INSTITUTE STAFF

Janet N. Abramovitz

Ed Ayres

Richard Bell

Chris Bright

Lester R. Brown

Lori A. Brown

Niki Clark

Suzanne Clift

Elizabeth Doherty

Seth Dunn

Barbara Fallin

Christopher Flavin

Hilary French

Gary Gardner

Joseph Gravely

Jonathan Guzman

Brian Halweil

Millicent Johnson

Reah Janise Kauffman

Sharon Lapier

Janet Larsen

Lisa Mastny

Ashley Mattoon

Anne Platt McGinn

Leanne Mitchell

Mary Redfern

Michael Renner

David Malin Roodman

Curtis Runyan

Payal Sampat

Molly O. Sheehan

Christine Stearn

Denise Warden

OFFICERS

Christopher Flavin

President

Richard Bell,

Vice President,

Communications

Ed Ayres

Editorial Director

Barbara Fallin

*Director of Finance and
Administration*

Gary Gardner

Director of Research

New This Year: Worldwatch CD-ROM

Worldwatch offers the data from all graphs and tables contained in this book, as well as all other Worldwatch publications, on CD-ROM for use with PC or Macintosh computers. This includes data from the *State of the World* and *Vital Signs* series of books, Worldwatch Papers, and *World Watch* magazine in an easy to use, searchable format. In addition, the complete text of this year's editions of *State of the World* and *Vital Signs* are included in Adobe PDF format. For more information or to order, please see our website (www.worldwatch.org), or call (800) 555-2028 or (301) 567-9522; e-mail wwpub@worldwatch.org.

Visit our website at www.worldwatch.org

67	Transportation Trends	
	Vehicle Production Sets New Record	68
	Bicycle Production Recovers	70
73	Health and Social Trends	
	Population Increases Steadily	74
	Cigarette Production Remains High	76
	AIDS Erodes Decades of Progress	78
81	Military Trends	
	War Trends Mixed	82
	Peacekeeping Expenditures Rebound	84
	Limited Progress on Nuclear Arsenals	86

PART TWO: SPECIAL FEATURES

91	Environmental Features		125	Transportation Features	
	World's Coral Reefs Dying Off	92		Urban Rail Systems Gather Steam	126
	Hydrological Poverty Worsening	94		Gasoline Taxes Vary Widely	128
	Wetlands Decline	96	131	Health Features	
	Bird Species Threatened	98		Antimicrobial Resistance Growing	132
	Farm Animal Populations Soar	100		Malaria's Lethal Grip Tightens	134
	Growth in Transgenic Area Slows	102		Being Overweight Now Epidemic	136
				Health Care Spending Uneven	138
105	Economy and Finance Features		141	Social Features	
	Pharmaceutical Sales Thriving	106		Migrants and Refugees on the Move	142
	PVC Plastic Pervades Economy	108		World's Many Languages Disappearing	144
	Microcredit Expanding Rapidly	110		Religious Environmentalism Rises	146
	Stock Markets Follow a Rocky Road	112		Education Still Falling Short of Goals	148
	Socially Responsible Investing Surges	114		Social Security Facing Challenges	150
	Toll of Natural Disasters Grows	116			
119	Resource Economics Features				
	Wheat/Oil Exchange Rate Skyrockets	120			
	Commodity Prices Weak	122			
153	Notes				
190	The Vital Signs Series				

ACKNOWLEDGMENTS

Each year, *Vital Signs* draws on the analytical and writing efforts of the entire research staff of Worldwatch Institute. Throughout the year, our researchers are busy following key trends, even while researching and writing papers and articles in their varied areas of expertise. Our full-time staff is joined in this tenth anniversary edition by two former senior researchers, Nicholas Lenssen and John Young, as well as by former interns Ann Hwang and Danielle Nierenberg, who has now joined Worldwatch as an adjunct researcher.

Independent editor Linda Starke once again brought a steady hand and years of experience to bear in unifying 49 manuscripts produced by 19 different authors scattered in a half-dozen locations to ensure consistency and readability throughout the book. Other members of the Institute's staff also play a vital role. Lori Brown and Jonathan Guzman run our library and ensure that researchers have access to the latest books, reports, and magazine articles and stay abreast of important studies and Web resources. Reah Janise Kauffman served as an invaluable liaison with the foreign publishers of *Vital Signs*.

Names not found in the individual bylines but nonetheless critical to this book are our operations team of Barbara Fallin, Suzanne Clift, and Sharon Lapiere; our development team of Mary Redfern and Millicent Johnson; our communications team of Dick Bell, Leanne Mitchell, and Niki Clark; and Joseph Gravely, who is responsible for shipping out publications.

Over the last year we redesigned the cover

and several of the internal elements of *Vital Signs* to enhance its visual attractiveness and highlight its interdisciplinary nature. Many "vital signs," for example, now include a small box to alert readers to related pieces they might find of interest. Ed Ayres, Dick Bell, Hilary French, Brian Halweil, Millicent Johnson, Michael Renner, Molly O'Meara Sheehan, Linda Starke, Christine Stearn, and Denise Warden volunteered their time to accomplish the redesign. But Art Director Elizabeth Doherty played the most crucial role, on top of her already considerable responsibilities in connection with desktop production of *Vital Signs* and other Worldwatch publications. Three photos Liz chose to use are from Photoshare, the online photo database of the Media/Materials Clearinghouse at the JHU/Population Information Program at <www.jhuccp.org/mmc>.

All contributions to this book were reviewed by in-house staff as well as by a number of outside experts. For particular help with data requests, advice, or feedback on drafts, the authors wish to thank Claudine Aholou Putz, Wasantha Bandarage, Ed Benjamin, Greg Bischak, Ed Bos, Colin Couchman, Martin Dasek, Satoshi Fujino, Frank Jamerson, Clive James, Paul Jenner, Ken Kassem, Katrina Kulp, Rich Liroff, Birger Madsen, Paul Maycock, Gerhard Metschies, Donald Mitchell, Martin Palmer, John Pilgrim, Pat Plunkert, Sandra Postel, Matthew Quinlan, Annette Renner, Robert Rice, Jose Santamarta, Wolfgang Schreiber, Joseph Sheehan, Vladimir Slivyak, Carrie Smith, Ron Srnka, Alison Stattersfield,

ACKNOWLEDGMENTS

Guy Taylor, Arnella Trent, Andreas Wagner, and Timothy Whorf.

At W.W. Norton & Company, our U.S. publisher, we are grateful to Lucinda Bartley, Amy Cherry, Andrew Marasia, and their colleagues for expediting our manuscript through the printing and publishing process. We thank them for their steady support over the years.

We also want to thank our new partner in *Vital Signs*, the United Nations Environment Programme. As described in the Foreword, we are now working together to provide the information and analysis needed to guide solid decisionmaking on environmental matters around the world. We thank Executive Director Klaus Töpfer and his entire staff in Nairobi and around the world for their dedication to the issues that we and they are so concerned about.

We are grateful to the W. Alton Jones Foundation for its funding of *Vital Signs 2001* and *Vital Signs 2002*, marking the tenth year of such support. The Jones Foundation's support of *Vital Signs* since its inception is central to allowing us to produce this volume each year. We thank Pete Myers, Charlie Moore, and the Board of the Jones Foundation for their dedication to a sustainable world and for their excellent work in nearly all of the fields that Worldwatch Institute focuses on, from climate change to biological diversity.

Some of the data we present in this book are outgrowths of our general research, conducted in the course of putting together *State of the World*, Worldwatch Papers, and *World Watch* magazine. We would therefore also like to thank the foundations that have supported this work during the past year: the Geraldine R. Dodge Foundation, the Ford Foundation, the Richard & Rhoda Goldman Fund, the William and Flora Hewlett Foundation, the John D. and Catherine T. MacArthur Foundation, the Charles Stewart Mott Foundation, the David and Lucile Packard Foundation, the Summit Foundation, the Turner Foundation, the Wallace Global Fund, the Weeden Foundation, and the Winslow Foundation.

In addition, we would like to acknowledge the support of the more than 2,000 individuals

who provided financial support through the Friends of Worldwatch program last year. Our special appreciation goes to the members of the Institute's Council of Sponsors—Tom and Cathy Crain, James and Deanna Dehlsen, Roger and Vicki Sant, Robert Wallace and Raisa Scriabine, and Eckart Wintzen—and to the group of Benefactors: Adam and Rachel Albright, Junko Edahiro, Sara and Ed Groark, Hunter Lewis, and Izaak van Melle.

This year, we also want to note with pain the passing of one of the leading thinkers in the sustainable development field, a person whose ideas have helped inspire and guide our publications. Donella H. Meadows, one of the co-authors of *Limits to Growth* in 1972, died this winter after a brief illness. Dana, as she was known, who taught at Dartmouth College, was one of the first scientists to develop the field of global trend analysis, and we are thankful for both her intellectual and her moral support over the last quarter-century. Her commitment and humanity inspired scores of young people to work in the field of global sustainability.

* * *

New this year, all the data in the tables and figures in *Vital Signs* are available on CD-ROM (see page 6 for ordering information). And individual *Vital Signs* indicators can be downloaded in Adobe PDF format from our Web site, <secure.worldwatch.org/cgi-bin/wwinst/titles/vs>. Please send us your ideas for future *Vital Signs* indicators. You can reach us by e-mail (worldwatch@worldwatch.org), fax (202-296-7365), or regular mail.

Michael Renner, Project Director
March 2001

Worldwatch Institute
1776 Massachusetts Ave., N.W.
Washington DC 20036

FOREWORD

This year, for the first time, Worldwatch Institute and the United Nations Environment Programme (UNEP) have joined forces on *Vital Signs*. These two organizations, with a common dedication to achieving a healthy global environment, have worked together on this tenth volume of the series that Worldwatch launched in 1992. We believe that *Vital Signs 2001* provides decisionmakers and the public the latest and most complete picture of the health of the planet and its people.

UNEP is the principal United Nations body in the field of the environment. It plays a lead role in shaping the global environmental agenda, and in forging and implementing important environmental agreements. In recent years, UNEP has stepped up its efforts to analyze the state of the global environment and to assess global and regional trends, providing early warning of environmental threats.

This new collaboration is intended to maximize the synergy between an official United Nations body and a private, nonprofit research institute—drawing on our combined analytical strengths and our complementary abilities to reach key audiences around the world. At this time of rapid and confusing change, we are particularly keen on providing the information and insights the world will need as it approaches the World Summit on Sustainable Development in Johannesburg next year.

With this tenth edition of *Vital Signs*, we reach an important milestone. In *Vital Signs 2001*, we now have data for the year 2000. This

has given us a full half-century perspective on many of the trends we follow, since most of our data sets begin in 1950, when global record-keeping became much more comprehensive and systematic.

For decades, analysts have been using the year 2000 as the end point for their long-term forecasts and projections. Now that this year has become a vantage point for looking backward, the view is breathtaking. The last half-century has been a period of sweeping, unprecedented change: change in the economy, change in society, and change in the very biosphere of the planet. Indeed, very few projections for the year 2000 have come anywhere close to the mark. Today we live in a world that is economically richer than could have been hoped for a half-century ago, but one that is ecologically poorer than hardly anyone could have imagined. Here are some of the trends of the last 50 years that are chronicled in this volume:

- There are now just over 6 billion people on the planet, up 3.5 billion since 1950, which means more than a doubling in just 50 years. Most of the growth has come in developing countries, many of them already overcrowded. The number of city residents has grown even faster—up fourfold since the middle of the twentieth century.
- The world economy has grown even more dramatically: up almost sevenfold in 50 years. This added wealth translates into

vast improvements in living standards—from nutrition to housing, health care, and transportation. But 1.2 billion people still live in severe poverty, and an estimated 1.1 billion do not have clean, safe water to drink.

- The world grain harvest has nearly tripled since 1950, allowing billions of people to enrich their diets. But the abundance of food has come at a price: falling freshwater aquifers and severe water pollution from massive use of fertilizers and pesticides. Despite the increase in production, over a billion people are still undernourished, while another billion are actually overnourished, which has created a global epidemic of obesity that is now spreading to the developing world.
- Emissions of carbon dioxide, the leading greenhouse gas, have risen by nearly 300 percent since 1950, boosting its concentration in the atmosphere to its highest level in at least 420,000 years. New scientific studies project dramatic changes in the climate in the current century, leading to increased storm intensity, agricultural losses, and economic disruptions due to accelerated global warming from the additional greenhouse gases.
- The world has lost more than half its wetlands and over one quarter of its coral reefs—losses that continue to accelerate. And the species that depend on these natural habitats are also in decline. Of the approximately 9,900 bird species that have been identified, 12 percent are threatened with extinction.

If there is one lesson of this extraordinary half-century, it is that most trends defy prediction by experts. The most important changes have generally come abruptly, with little warning. We never seem to know where the latest economic crisis or ecological catastrophe will come from, but we do know that the projections of smooth, gradual change that computer models churn out are almost always wrong. Until the 1970s, for example, oil forecasters were projecting exponential growth in demand

and steady, low prices through the end of the century—until severe oil shocks forced a wholesale revision in this sanguine outlook. The forecasters then moved as a herd to the conclusion that an era of permanent shortages would drive oil prices over \$100 per barrel in 2000—just in time for the collapse of oil prices to \$10 per barrel in the mid-1980s.

As the world becomes ever more complex, predicting the future becomes an ever less productive enterprise. But planning for the future can minimize the risks and maximize the opportunities presented by a fast-changing world. From this perspective, the challenge of the twenty-first century is to extend the economic progress of the last 50 years while halting the ecological decline and social misery that have sometimes marred this remarkable period. The first step is to understand the clear message that emerges from the welter of statistics in *Vital Signs 2001*: despite all the wonders of the modern information age, the human economy emerged from Earth's biosphere and remains dependent on it. A sick planet will, sooner or later, lead to a faltering economy.

The last year brought vivid reminders of that dependence. Just as the information economy fell to Earth, soaring oil and natural gas prices showed the economy's reliance on fuels contained in that earth. And the impressive proliferation of high-tech drugs and medical treatments was unable to prevent catastrophic new epidemics of human and animal diseases—or the social and economic chaos that have come with them. At the same time, computer-based weather forecasts have become remarkably sophisticated—but failed to prevent the economic toll of natural disasters from reaching \$608 billion in the 1990s, more than 15 times the total for the 1950s.

The dramatic spread of democracy and open markets in the last decade, together with explosions in technology and communications, could lead to revolutionary change that would make the world a better place. But this will only happen if humanity acknowledges—and acts on the knowledge—that we remain dependent on a healthy natural world. Global inte-

gration provides the opportunity to raise living standards around the world, but also forces us to confront the fact that AIDS and foot-and-mouth disease can be efficiently carried halfway round the world in a matter of hours on the same aircraft that move people and goods so efficiently.

The new century has begun with many surprises, most of them unwelcome. But one thing is virtually certain: the next half-century will

not see a repeat of the trends of the one just past. Earth simply will not support it. The question is whether humanity will forge a healthier, sustainable future or risk the downward spiral that would be the result of failing to understand the ecological and economic threshold on which we now stand. We hope that the statistical snapshot contained in *Vital Signs 2001* will help provide that understanding.

Christopher Flavin
President
Worldwatch Institute

Klaus Töpfer
Executive Director
United Nations Environment Programme

TECHNICAL NOTE

Units of measure throughout this book are metric unless common usage dictates otherwise. Historical population data used in per capita calculations are from the Center for International Research at the U.S. Bureau of the Census. Historical data series in *Vital Signs* are updated each year, incorporating any revisions by originating organizations.

Data expressed in U.S. dollars have for the most part been deflated to 1999 terms. In some cases, the original data source provided the numbers in deflated terms or supplied an appropriate deflator, as with gross world product data. Where this did not happen, the U.S. implicit gross national product (GNP) deflator from the U.S. Department of Commerce was used to represent price trends in real terms.

OVERVIEW

The Triple Health Challenge

Michael Renner

This edition of *Vital Signs* presents a three-dimensional, integrated picture of Earth's health—environmental, human, and economic. Today's economy—thriving on massive resource use, generating large amounts of pollutants, and disrupting natural cycles—imposes increasingly unsustainable burdens on the environment. And the deterioration of critical ecosystems like wetlands and coral reefs can boomerang: communities have less protection against extreme weather events, and disease vectors are able to spread more easily, compromising human health and well-being. Measures taken in the name of furthering public health, on the other hand, can sometimes throw natural balances out of kilter: the escalating use of antibiotics, for instance, helps produce more virulent infectious disease strains. Environmental crises and health epidemics translate into rising economic costs—in the form of property losses from natural disasters and skyrocketing health care bills.

The health of human societies and the natural environment is strongly related to how robust they are in the face of adverse developments. Resilience derives in large part from diversity. Yet modern societies and economies have pursued specialization to the point where much of our rich biological and cultural diversity has vanished. This is true for livestock and birds as well as for coffee plantations and languages. The 49 trends documented in *Vital Signs 2001* provide some measure of that disappearing diversity, and of recent attempts to bolster our resilience.

ECOSYSTEM HEALTH

Decimating forests, damming rivers, draining wetlands, spreading copious amounts of toxic and long-lived materials, and destabilizing the climate have all contributed to an unraveling of Earth's complex ecological safety net.

More than half the world's wetlands vanished during the past century, for example—primarily in the northern hemisphere during the first half and mostly in the South during the second half. (See Figure 1 and pages 96–97.) Half of the remaining coastal wetlands are likely to be lost by 2080 to agriculture, urban sprawl, and rising sea levels as a consequence of climate change. These marshes, bogs, swamps, and peatlands provide a range of vital services: regulating water flow, recharging groundwater supplies, providing flood control, retaining essential nutrients, buffering other ecosystems against contaminants, and offering habitat for diverse biological communities.

The health of coral reefs worldwide is also deteriorating rapidly. (See Figure 2 and pages 92–93.) The share of reefs severely damaged rose from 10 percent as recently as 1992 to 27 percent in late 2000. Reefs provide a range of crucial ecological services and goods. They shelter coastlines from storm damage, erosion, and flooding, serving as protection for an estimated half-billion people, and they provide habitat for as many as 1 million different species. But they are also important feeding and breeding grounds for commercial fisheries, producing one tenth the global fish catch.

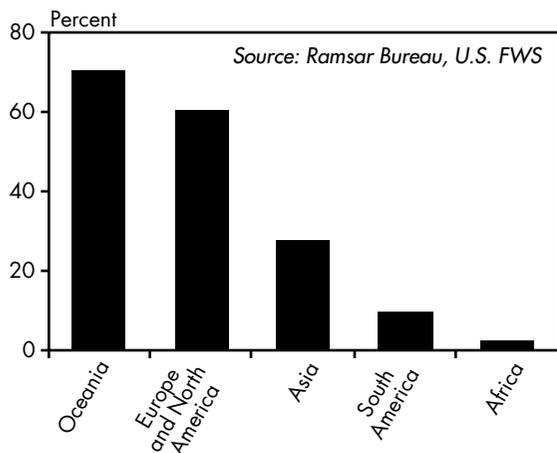


Figure 1: Percent of Wetlands Lost, by Region, 2000

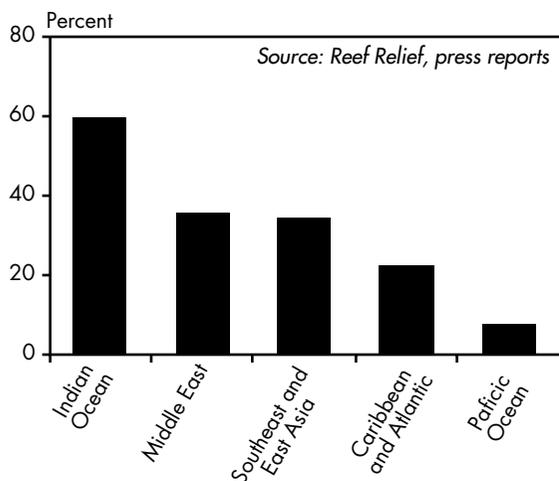


Figure 2: Percent of Coral Reefs Destroyed, by Region, 2000

The decay of ecosystems sets the stage for more frequent and more devastating “un-natural” disasters—natural disturbances made worse by human actions. (See pages 116–17.) And human vulnerability has increased due to the migration of people to coastal areas and urban centers and the expansion of the built environment. More than one third of humanity dwells within 100 kilometers of a coastline.

Climate change threatens to intensify many of the problems. Coral reefs, for instance, live at the upper edge of their temperature tolerance, and rising ocean temperatures spell greater stress for reefs. Impaired coral reefs are in turn less able to provide shelter against the rising storms associated with climate change. Climate change also expands the geographic reach of the *Anopheles* mosquito that transmits malaria. (See pages 134–35.)

Fossil fuel combustion has been a major driver of climate change. Although the use of oil, coal, and natural gas has declined slightly—down 0.3 percent from 1998—it is still extremely close to recent peak levels. (See pages 40–41.) One of the main factors is the unabated growth in the number of cars on the world’s roads and the distances driven in them, along with inadequate progress in boosting fuel economy to offset these increases. Global automobile production rose 4 percent in 2000 to reach a record 40.9 million vehicles, and the total fleet grew to 532 million. (See pages 68–69.)

With annual carbon emissions from fossil-fuel combustion quadrupling over the past half-century to about 6.3 billion tons in 2000, a total of almost 220 billion tons of carbon have been released into the atmosphere. (See pages 52–53.) Carbon dioxide is only one of several greenhouse gases; chlorofluorocarbons, methane, and nitrous oxide play important additional roles. So do perfluorocarbons, released in the process of aluminum smelting—an energy-intensive and polluting process that has expanded 16-fold since 1950. (See pages 64–65.)

In order to stave off full-blown climate change, large-scale reductions in carbon emissions far beyond the 0.6-percent decline achieved in 2000 are needed. Unless drastic action is taken, however, annual emissions are actually expected to grow to 9–12 billion tons by

2020 and possibly to twice that number by 2050. In a new assessment in January 2001, the Intergovernmental Panel on Climate Change revised upward its projections for temperature increases during this century, which would make more frequent weather events—both droughts and storms—more likely. (See pages 50–51.)

Modern agriculture, too, is imposing significant environmental burdens. Livestock populations have almost tripled since 1961 and currently contribute 16 percent of total emissions of methane, a greenhouse gas far more potent than carbon dioxide. (See pages 100–01.) Traditional mixed farming systems, in which farm animals are kept in close proximity to crop production, allow for animal wastes to be returned to the soil—a practice that has helped maintain soil fertility and limited the need for synthetic fertilizers. Today this approach is often giving way to input-intensive methods. North America and Europe pioneered this industrial production system, but it is now spreading to countries like Brazil, China, and India.

Under the so-called feedlot system, accumulated animal wastes present a major threat to soil, air, and water quality. Groundwater resources are threatened by contamination from the excess nutrients in livestock manure and from agricultural runoff. Water quality worldwide is imperiled by these and a range of other sources that dump nitrates, pesticides, petrochemicals, arsenic, chlorinated solvents, and radioactive wastes into aquifers.

PUBLIC HEALTH

Societies across the planet confront a resurgence of infectious diseases, some well-known and some previously unknown. AIDS and malaria are among the biggest killers, causing the deaths of several million people each year. The spread of microbes that cause these diseases is facilitated by international travel, agricultural trade, and human population movements—all of which are on the upswing. (See pages 62–63 and 142–43.)

Environmental factors also play an impor-

tant role in human susceptibility to and transmission of diseases, particularly malaria, diarrheal diseases, and acute respiratory infections. Worldwide, close to one fourth of all disabilities can be traced back to such factors as polluted air and water and unsafe food. More than 3 million people die each year worldwide from water-related diseases, mostly in developing countries. (See pages 94–95.)

The AIDS crisis marches on. To date, some 58 million people have been infected with HIV, the virus that causes AIDS; of these, 22 million have succumbed to the disease. (See pages 78–79.) And each year, nearly 6 million additional people are newly infected. Sub-Saharan Africa faces the most severe challenge: it is home to two thirds of the world's HIV-positive population. There, as elsewhere, people living in poverty, minorities, and women are hardest hit by the disease.

Malaria has staged a lethal comeback. (See pages 134–35.) It has been riding the coattails of environmental degradation (logging, dam- and road-building, and the warmer temperatures and increased precipitation associated with climate change) and the social upheaval caused by wars and refugee flows. Malaria remains one of the world's deadliest diseases, each year infecting nearly a half-billion people and claiming more than a million lives. Although close to 40 percent of the world's population is at risk, again inhabitants of sub-Saharan Africa are most affected. Among Africans, the death rate from malaria is nine times higher than the global average (see Figure 3), a consequence of higher exposure to disease vectors, the emergence of drug-resistant strains, and the sad fact of grossly inadequate health services.

Increasing drug resistance among microbes that cause a range of deadly illnesses makes many of these diseases harder and more expensive to control and threatens to reverse public health achievements of the past half-century. (See pages 132–33.) A key factor in making microbes more immune to drug treatment is the skyrocketing use of antibiotics and other antimicrobial drugs. At least half of all anti-

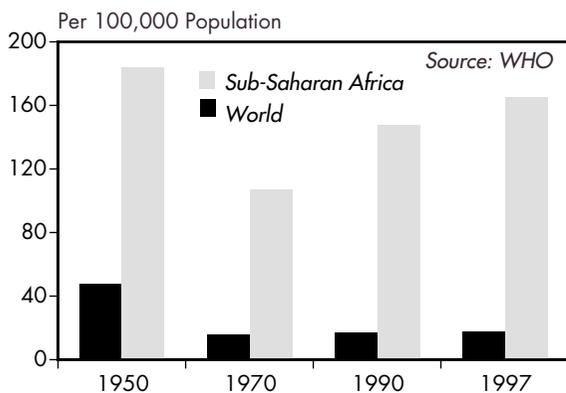


Figure 3: Malaria Mortality Rate

biotics used worldwide are believed to be prescribed unnecessarily, partly because of patient demand, but often also as a result of pressure from pharmaceutical companies and health management groups.

Another reason for rising drug resistance is the surging use in agriculture, horticulture, and animal husbandry of many of the same antibiotics used in human medicine. The ever-present threat of disease outbreaks in feedlots, where livestock are kept in intensive confinement, is strong incentive for massive applications of antibiotics. But farmers also know they can boost livestock growth by mixing antibiotics into animal feed. The practice of intensive feeding of grain, antibiotics, and hormones dramatically cuts the time required for cattle to reach market weight. (See pages 100–01.)

Industrial methods in animal husbandry have come into heavy disrepute in Europe with the outbreak of “mad cow” and foot-and-mouth disease in the United Kingdom and several other nations. Millions of people now question the once routine consumption of meat and meat products and consider industrial livestock production a prime threat to maintaining public health.

The pervasive use of synthetic materials has also triggered concern about health and environmental impacts. One example is polyvinyl chloride (PVC), the second most common plastic in the world. (See pages 110–11.) Some 250 million tons are in use today in building mate-

rials, packaging, electrical wiring, and many consumer goods, and 100 million tons have already been discarded. Production continues to grow rapidly—rising 39 percent between 1992 and 1999. But both PVC production and disposal generate highly toxic waste products. Dioxins, furans, and other compounds pollute the air, can leach into the soil and bodies of water, or can be ingested by plants, fish, and people. Consumers, governments, and private companies are increasingly questioning the use of PVCs, particularly since alternatives exist for most applications.

Illnesses induced by lifestyle choices are another key public health concern. Each year, 4 million people die prematurely from tobacco-related illnesses. World cigarette production remains near record levels, though per capita supplies are down more than 10 percent over the past decade. (See pages 76–77.) Although growing numbers of people in industrial nations reject smoking, cigarette sales in developing countries are on a strong upward trajectory. China is the world’s leading consumer of cigarettes. But the increase in smoking is especially pronounced in Africa—if current growth rates continue over the next two decades, more Africans could die from tobacco-related illnesses than from AIDS, malaria, and childbirth complications combined.

Increasingly sedentary lifestyles are a key factor behind a new global epidemic: overweight and obesity, its more extreme form. (See pages 136–37.) Obesity closely correlates with trends in television viewing and car ownership, both of which indicate a lack of adequate physical activity. Inadequate exercise, together with high consumption of sugar and fat, explains why one out of six people worldwide is now considered overweight. This is a major factor behind chronic diseases such as stroke, heart disease, cancer, and diabetes, which exert strong upward pressure on health care costs. Although these diseases of affluence are found predominantly in industrial countries, developing countries are increasingly affected: the

World Health Organization predicts that chronic diseases will surpass infectious ones as a burden on developing countries over the next quarter-century.

Health care expenditures have grown rapidly over the past 50 years, outpacing the growth of the overall economy and becoming one of its largest sectors. (See pages 138–39.)

Skyrocketing health care outlays are in part driven by rising costs for prescription drugs. At the same time, health expenditures are heavily skewed toward the wealthier parts of humanity; hundreds of millions of poor people have no access to basic and affordable care.

The best-selling drugs are designed to treat First World illnesses, including heart disease, high blood pressure, and indigestion. Seeing a market without much purchasing power, pharmaceutical companies have tended to neglect the health needs of large chunks of the planet, including research on malaria vaccines. (See pages 106–07.) Only 1 percent of 1,233 new drugs that reached the market between 1975 and 1997 were approved specifically for tropical diseases. Roughly one third of humanity lacks regular access to essential drugs; one fourth of all children do not receive routine immunization with the six basic vaccines against polio, diphtheria, whooping cough, tetanus, measles, and tuberculosis.

ECONOMIC HEALTH

Ecosystem breakdown and a rising disease burden are increasingly taxing economic health, particularly that of poorer countries and of the poor within all societies. In the worst cases, environmental and health deterioration could trigger economic decay and social fragmentation, and perhaps even political upheaval.

The past 50 years have seen a dramatic increase in great disasters, which as noted earlier have increasingly been helped along by the human hand. At more than \$600 billion, the economic toll of natural disasters during the 1990s alone was more than that of the previous four decades combined. (See pages 116–17.) More than 2 billion people worldwide were

affected by disasters in the 1990s.

Untreated yet treatable diseases not only cause unnecessary illness, suffering, and premature death, they also represent an economic burden. For example, African economies have lost an estimated \$100 billion over the past 35 years due to malaria alone—losses that many of these struggling economies can ill afford. (See pages 134–35.) Resistant infections are costlier to treat than regular ones, and translate into prohibitive costs in poorer countries. The cost differential between highly resistant and regular strains of tuberculosis, for instance, can be as high as 100. (See pages 132–33.) As infectious diseases spread and more drug-resistant strains emerge, the prospect is one of escalating costs.

AIDS is killing the most economically productive people—the young, a cornerstone of any country's work force. The disease also has a devastating impact on education prospects in many countries. It is responsible for 70 percent of the deaths of teachers in Côte d'Ivoire, for instance. (See pages 148–49.) This epidemic, in concert with other diseases, threatens to overwhelm the feeble health systems of many developing countries. In just two decades, AIDS has erased a half-century's gains in life expectancy in many African nations. The impacts are severe enough to threaten social stability in nations that are already reeling economically and hard hit by violent conflicts raging on their territories. (See pages 82–83.)

The explosive rise in drug costs is affecting health care systems worldwide, making the profits (and great profitability) of the drug industry an increasingly controversial political issue. (See pages 106–07.) Reducing the cost of pharmaceuticals is a life-and-death issue for the poor. The need to make treatment affordable is particularly urgent for the millions of people living with HIV/AIDS. But this has turned into a high-stakes battle for markets and public opinion. Although a few pharmaceutical companies have agreed to reduce prices, many others—focused on their bottom lines—have opposed cheaper generic drugs offered by companies in Brazil and India.

The specter of unaffordable drugs would

appear to be a paradox in a world that ostensibly grows richer year after year. The world economy has expanded sevenfold since 1950, from \$6 trillion to \$43 trillion in 2000 (in 1999 dollars). (See pages 56–57.) But gross national product is clearly not a good indicator of how sound an economy is, how well people's current needs are being met, and how people will fare in the future. In fact, the economy is growing in part because the rising expenditures to deal with environmental and social calamities are counted as if they contributed to, rather than subtracted from, human well-being.

Economic health depends not just on a sufficiently large economic pie, but also on how that pie is sliced. The rewards and amenities that the economy provides continue to be divided up in extremely unequal fashion. In recent years, stock markets became increasingly prominent, with their capitalization rising to rival the size of the world economy by the late 1990s, driving a consumption boom in the United States and other western economies. (See pages 112–13.) But highly unequal stock ownership has contributed to a widening of wealth disparities not seen in many decades. And the volatility of equities markets that has been seen in recent months can potentially wreak havoc in an economy and distort social and economic development.

Even as the global economy continued on its upward trajectory, many developing countries were hard pressed to cover the basics. Following the largest single-year increase in 1998, the foreign debt of these nations remained high in 1999—\$2.6 trillion. (See Figure 4 and pages 58–59.) While Latin American countries have managed to reduce their debt burden in recent years, other developing and former Eastern bloc nations have not. And sub-Saharan Africa confronts the specter of debt eating away at an ever growing share of its economy.

Many developing countries are struggling with an endless slide in the prices that their

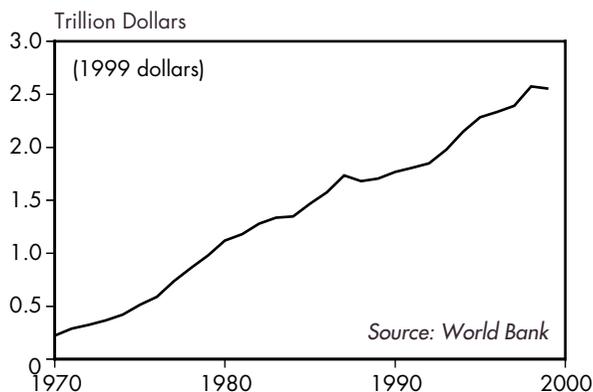


Figure 4: Foreign Debt of Developing and Former Eastern Bloc Nations, 1970–99

raw materials fetch in the world market; 65 nations rely on a single commodity for 40 percent or more of their foreign-exchange income. (See pages 122–23.) On average, nonfuel commodity prices are at less than half their mid-1970s level, and at only one third their 1900 level. Consequently, exporting countries have had to sell ever larger amounts of raw materials to make up for the decline in prices; in fact, so many have pursued the same export-oriented strategy that prices have been weakened even more. In the quest for export revenues—needed to pay off ballooning foreign debts—the environment has become a casualty of stepped-up mining, logging, and other resource extraction operations.

World coffee production, for instance, hit an all-time record in 2000. (See pages 36–37.) The higher yields that powered much of this growth have largely come from a shift from traditional mixed-use plots shaded by trees to larger areas of land where coffee is grown in monoculture fashion in the full sun. This has contributed to deforestation, to loss of biodiversity, and, because of heavier use of fertilizers and pesticides, to water pollution and the poisoning of farmland.

Food trade has grown particularly fast, quadrupling in volume and nearly tripling in dollar value since 1961. (See pages 62–63.) But falling world market prices for agricultural

products have thrown many farmers in developing and industrial nations into rising debt, even as local food markets are increasingly embattled by cheap imports frequently controlled by a handful of transnational corporations.

SOLUTIONS

Even as the challenges to environmental, public, and economic health are rising, it is becoming clear what some of the solutions might look like. *Vital Signs 2001* discusses a number of these.

The rise in the prominence of stock markets and the growing influence of private corporations has motivated efforts to promote socially and environmentally responsible investing. (See pages 114–15.) This has taken a number of forms, including the channeling of money into investment funds that screen companies according to a variety of criteria, such as labor standards, environmental protection, and human rights. Many of these funds attempt to screen out the tobacco and military industries in particular. In the United States, money invested according to social and environmental criteria grew to about \$2 trillion in 1999, or about one eighth of the total funds under professional management in the nation. Using a different approach, shareholder activists have tried to steer corporate policy toward more sustainable practices, introducing shareholder resolutions on issues like climate change, old-growth forests, genetically engineered organisms, and tobacco.

Whereas efforts to promote more responsible investment paths aim at the realms of high finance, microcredit initiatives try to help the poor overcome poverty and health problems. (See pages 110–11.) Microcredit, the provision of small-scale financial services to those not served by commercial banks and other lenders, is expanding rapidly. Almost 24 million people found assistance through such programs in 1999 (see Table 1),

and the aim is to reach 100 million by 2005. Some of the most effective programs combine income-generating activities with educational efforts, covering such topics as immunization against infectious diseases, diarrhea prevention, and HIV/AIDS counseling. Microcredit programs offer particular hope to women, who account for a disproportionate share of the recipients of small-scale loans. Although such loans hold considerable promise, it is also clear that they alone cannot serve the needs of the extremely poor; improved social security programs are still essential. (See pages 150–51.)

Besides socially responsible investment endeavors, there are also “ethical” consumer initiatives. Support for organically grown and “fair trade” coffee (produced under fair price and working conditions), though a small share of global coffee sales, is expanding rapidly. Such efforts are crucial to support coffee-growing that does not damage the environment irreparably or cause grave harm to the health of millions of coffee growers and workers. (See pages 36–37.)

Modern chemistry is no longer regarded as

Table 1: Growth and Composition of Microfinance Institution Clients, 1999

Region	Number of Clients (thousand)	Increase over 1998 (percent)	Poorest as Share of Clients ¹
Africa	3,834	29	68
Asia	18,427	10	57
Latin America and the Caribbean	1,110	12	48
Middle East	47	6	61
North America	47	16	61
Europe and Countries in Transition	44	8	42
World	23,556	12	58

¹The bottom 50 percent of a country's population living below the poverty line.

Source: Microcredit Summit, “Empowering Women with Microcredit: 2000 Microcredit Summit Campaign Report,” <www.microcreditsummit.org/campaigns/report00.html>, viewed 26 February 2001.

an unblemished blessing. Now efforts are directed at limiting or stopping the use of compounds that have proved to be highly toxic. In December 2000, officials from 122 nations signed a treaty to phase out a dozen of the most dangerous chemicals ever created, which are part of a group called persistent organic pollutants. The pesticide DDT is to be eliminated under this agreement. But since it has been used in malaria control efforts, some temporary exemptions were granted until alternatives can be phased in. The 1998 Roll Back Malaria Program, initiated by the World Bank and others, combines safer chemicals and nonchemical tools with efforts to strengthen public health systems. (See pages 134–35.)

A number of products and materials that carry high health risks or whose impacts are uncertain are attracting increasing scrutiny, and sometimes rejection, by consumers. This has been the case for PVC plastics, cigarettes, meat (following highly publicized outbreaks of mad cow disease and growing concern over the use of antibiotics in feed), and genetically modified crops.

In previous editions of *Vital Signs*, we have noted the promise that emerging wind power and solar electricity technologies hold for shifting away from our heavy reliance on fossil fuels. Though still contributing only a small share of the world's energy, both continued to surge in 2000. (See pages 44–47.) Ten times as much electricity is generated through wind power now as in 1990, and production of photovoltaic or solar cells is 10 times larger than in 1987. For now, applications of these innovative energy sources are concentrated in industrial countries.

Efficiency improvements are as crucial as developing renewable sources of energy. In *Vital Signs 2001*, we report on energy use in aluminum production, one of the most energy-intensive industries on Earth. (See pages 64–65.) Producing aluminum from recycled materials takes only 5 percent as much energy as producing it from bauxite ore. Recycled aluminum now accounts for 26 percent of total aluminum production, up just slightly from 21 percent in 1950 (and much of this is from alu-

minum scrap rather than “post-consumer” materials). A major expansion of post-consumer recycling is both possible and necessary in order to rein in the industry's large energy consumption.

Reducing the extreme reliance on cars in modern transportation could also save substantial amounts of energy. Recovering from a three-year decline, global bicycle production in 2000 rose by 22 percent, buoyed by rising purchases in China, Europe, and the United States. (See pages 70–71.) Bicycling also has important health benefits for people who need to lose weight. Another alternative to the automobile, urban light rail, is becoming increasingly popular. (See pages 126–27.) In Western Europe, a decades-long decline in this form of transportation has been reversed, and in the United States, light-rail riders are the fastest-growing segment of public transit riders. In combination, light rail systems and bicycling offer an attractive alternative to cars in many urban settings, provided that population densities are sufficiently high.

Finally, meeting the triple health challenge and achieving sustainability is not only about better technologies. Awareness and spiritual commitment to saving the planet and its inhabitants are critical. Religious communities of all different faiths are becoming a significant force for environmental change. (See pages 146–47.) Activities range from advocating sustainable resource use to supporting efforts to protect Earth's biological heritage, improving the stewardship of the estimated 5 percent of the world's land directly owned or controlled by religious groups, spurring green markets, and promoting energy alternatives. Many of these efforts derive from a desire to restore balance to the relationship of humans and their natural environment in a world that all too often worships at the altar of unbridled consumerism. The holistic nature of religious teachings helps reinforce the understanding that solutions will be most effective if they address environmental, human, and economic health together.

Energy Trends

PHOTOGRAPH BY DICK ROSS/PETER ARNOLD, INC.



Fossil Fuel Use Falls Again
Nuclear Power Inches Up
Wind Energy Growth Continues
Solar Power Market Surges

Worldwide consumption of coal, oil, and natural gas declined in 2000 for the second consecutive year, inching down by 0.2 percent to 7,643 million tons of oil equivalent.¹ (See Figure 1.) Nonetheless, global fossil fuel use has expanded by more than three and a half times since 1950.² And fossil fuels currently account for 90 percent of commercial energy use.³

Consumption of coal, which provides 25 percent of world commercial energy, fell for the fourth year in a row, by 4.5 percent.⁴ (See Figure 2.) U.S. coal use, which is just over one quarter of the world total, increased by 1.6 percent as growing electricity demand spurred coal-fired power generation.⁵ But China, also with about a quarter of world coal use, witnessed a drop of 3.5 percent.⁶ Indeed, Chinese coal use has fallen by 27 percent since 1996, with reductions in heating and industrial use more than offsetting increases in coal use for electricity.⁷ Coal consumption rose by 5.4 percent in India, the third leading user, with 7 percent of the global total.⁸

Links: pp. 52, 120, 128

Use of oil, which provides 41 percent of world commercial energy, expanded by 1.1 percent.⁹ The United States, the leading petroleum user, with a 26-percent share, increased consumption by 0.1 percent.¹⁰ In the Asia Pacific region, which uses 27 percent of world oil, consumption rose by 2.6 percent.¹¹ In Europe, the destination of 22 percent of world oil, use edged up 0.2 percent.¹²

Natural gas consumption, which totals 24 percent of world commercial energy, rose by 2.1 percent.¹³ The United States, which accounts for 27 percent of world natural gas use, experienced a 2.4-percent expansion.¹⁴ Growth was strongest in former Eastern bloc nations like Lithuania, Estonia, and Latvia, which increased consumption by 29, 30, and 45 percent, respectively.¹⁵ South Korea and Spain led gas growth in Asia and Europe, each expanding use by 16 percent.¹⁶

Oil and natural gas consumption were both influenced by higher market prices. The world price of oil hit its highest point since 1985, just below \$35 per barrel, despite a 5.8-percent

annual increase in oil production by the Organization of Petroleum Exporting Countries.¹⁷ (See Figure 3.) As oil prices eased in December, U.S. natural gas prices were four times as high as in mid-1999, creating concerns about rising home heating and electricity costs for consumers.¹⁸

High prices also renewed interest in additional oil and gas exploration in the untapped Arctic fields of Russia and Alaska. But drilling in the Russian Arctic would require billions of dollars more than has already been spent there.¹⁹ Drilling in Alaska's Arctic National Wildlife Refuge, meanwhile, is unlikely to begin before 2010 and would yield, according to a mean estimate, only 10.3 billion barrels of recoverable oil—the equivalent of one and a half years of U.S. oil consumption.²⁰

In its *World Energy Outlook 2000*, the International Energy Agency (IEA) projects fossil fuel consumption trends between 1997 and 2020.²¹ Overall use of these fuels is expected to grow by 57 percent (2 percent annually), maintaining their 90-percent share of world energy use.²² Coal use is due to increase by 1.7 percent annually, with two thirds of the growth occurring in China and India.²³ Petroleum will remain the dominant source, says the IEA, its use expanding by 1.9 percent annually and its share of primary energy reaching 40 percent.²⁴ Natural gas consumption grows fastest among fossil fuels in the projections, by 2.7 percent a year, primarily due to increased use for power generation.²⁵

The IEA analysis also contains assumptions, however, that suggest how reality may differ from these projections.²⁶ It assumes that prices will remain flat over the next decade—in contrast to recent events. In addition, it assumes that no additional steps are taken to reduce carbon emissions beyond those already adopted in response to the Kyoto Protocol on climate change. An anticipated peak in worldwide oil production and growing public pressure to address global warming could undermine both of these assumptions—accelerating the transition from coal to oil to natural gas and the displacement of fossil fuels by hydrogen and renewable sources of energy.

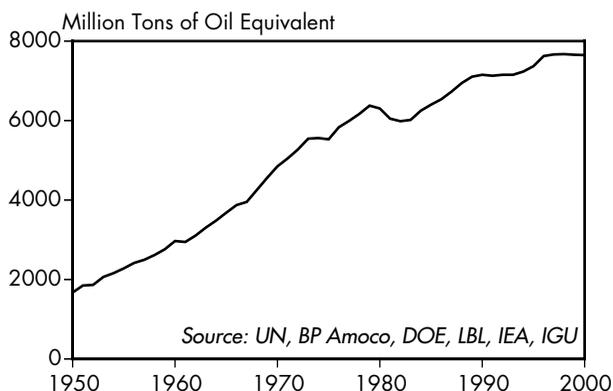


Figure 1: World Fossil Fuel Consumption, 1950–2000

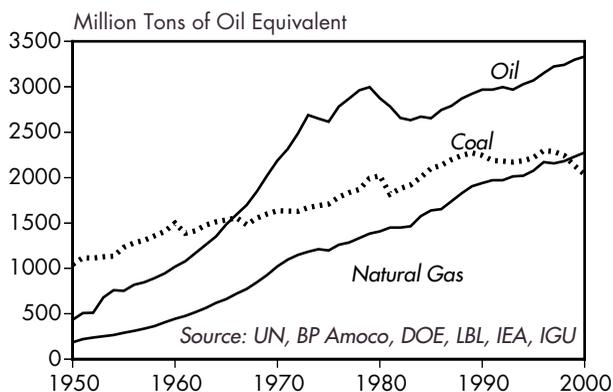


Figure 2: World Fossil Fuel Consumption, by Source, 1950–2000

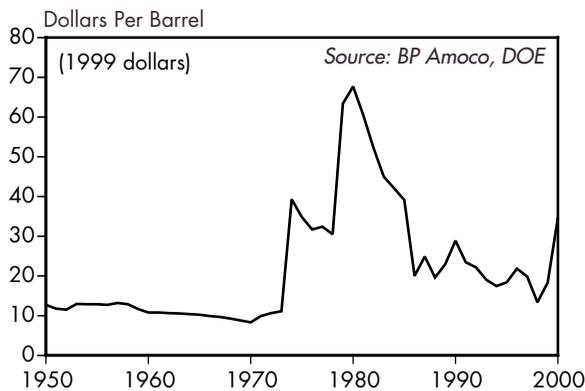


Figure 3: Real Price of Oil, 1950–2000

World Fossil Fuel Consumption, 1950–2000

Year	Coal	Oil	Natural Gas
	(mill. tons of oil equivalent)		
1950	1,043	436	187
1955	1,234	753	290
1960	1,500	1,020	444
1965	1,533	1,485	661
1970	1,635	2,189	1,022
1971	1,632	2,313	1,097
1972	1,629	2,487	1,150
1973	1,668	2,690	1,184
1974	1,691	2,650	1,212
1975	1,709	2,616	1,199
1976	1,787	2,781	1,261
1977	1,835	2,870	1,283
1978	1,870	2,962	1,334
1979	1,991	2,998	1,381
1980	2,021	2,873	1,406
1981	1,816	2,781	1,448
1982	1,878	2,656	1,448
1983	1,918	2,632	1,463
1984	2,001	2,670	1,577
1985	2,100	2,654	1,640
1986	2,135	2,743	1,653
1987	2,197	2,789	1,739
1988	2,242	2,872	1,828
1989	2,272	2,921	1,904
1990	2,244	2,968	1,938
1991	2,189	2,967	1,970
1992	2,179	2,998	1,972
1993	2,171	2,969	2,012
1994	2,186	3,027	2,019
1995	2,218	3,069	2,075
1996	2,298	3,150	2,170
1997	2,285	3,224	2,155
1998	2,243	3,241	2,181
1999	2,130	3,296	2,230
2000 (prel)	2,034	3,332	2,277

Source: Worldwatch estimates based on UN, BP Amoco, DOE, LBL, IEA, and IGU.

Between 1999 and 2000, total installed nuclear power generating capacity increased by less than 0.5 percent, bringing the total to a new high of 347,734 megawatts.¹ (See Figure 1.) Overall, the growth was just 1,598 megawatts, or about one-and-a-half large reactors.

Altogether, 435 reactors were listed as grid-connected at the end of 2000.² Six reactors were completed—three in India and one each in Brazil, the Czech Republic, and Pakistan.³ But these were partly offset by the closure of four reactors, bringing to 99 the number of reactors (representing more than 30,000 megawatts) that have been retired after an average service life of less than 18 years.⁴ (See Figure 2.)

In 2000, construction started on just one reactor, in China.⁵ (See Figure 3.) Worldwide, some 25 reactors (with a combined capacity of 22,000 megawatts) are now under active construction—the equivalent of just 6.3 percent of current installed capacity.⁶

In North America and Western Europe, no new reactors are being built, nor are there any firm plans to add more. The future of nuclear power there depends on whether shutdowns of existing reactors will be accelerated or delayed. In the United States, consolidation of nuclear operators and higher-than-anticipated electricity prices have held up some early closures previously anticipated by financial analysts.⁷

In Western Europe, however, Germany's government and nuclear industry agreed to phase out nuclear power. The 19 reactors in the country will be shut down after 32 years of operation, so the last plant will be closed in roughly 20 years.⁸ Two reactors closed in England, and another 14 there are likely to stop operations by 2010.⁹ Sweden, though, delayed shutting down its second reactor until 2003 at the earliest due to the immediate unavailability of zero-carbon replacement power.¹⁰ France's de facto moratorium on starting new projects is likely to hold until at least 2002.¹¹

Plants have closed in the former Soviet bloc too. In Ukraine, the final reactor at the Chernobyl site shut down.¹² And Kazakhstan permanently shut down a small, Soviet-designed reactor in 2000.¹³ Russia is likely to close one

aging reactor in 2001 and another in 2002, but also to open a new one in 2001.¹⁴

The Czech Republic connected a new reactor, Temelin 1, to the grid in late 2000, only to disconnect it a day later.¹⁵ The future of this plant is quite uncertain, given strong political opposition to it from Austria and Germany and ongoing technical problems.¹⁶

China has become the world's stronghold for new reactor construction, hosting nearly a third of the projects being worked on. Next are Japan and South Korea, each with four new reactors being built, though Japan cut its long-term target for new reactors in half in 2000, to just 10, due to public opposition.¹⁷

Meanwhile, India opened three new, small reactors in 2000, and efforts are under way to fund the expansion of nuclear capacity from today's 2,503 megawatts to 20,000 megawatts by 2020.¹⁸ But India had only two reactors, accounting for less than 1,000 megawatts, under construction at the end of 2000.¹⁹

After 24 years, Brazil finally completed its second reactor.²⁰ But other developing countries took the opposite approach in 2000, canceling existing projects or plans to begin new ones. Cuba stopped work on two Soviet-designed reactors it had been working on since 1983 and 1985.²¹ And Turkey halted efforts to order its first reactor, a project that the country has been pursuing for some 30 years.²²

In Taiwan, the country's newly elected government kept a campaign promise to halt work on two reactors.²³ In early 2001, however, it appeared as if supporters of the project forced the executive branch to back down and construction would restart.²⁴

The shrinking market for new plants has led to an industry shakeout. For example, the French firm Framatome and Germany's Siemens merged their nuclear businesses in 2000.²⁵ Other companies have chosen to get out of the business completely, as ABB did in 2000.²⁶ And the venerable U.S. engineering firm, Stone & Webster, which had a hand in building most U.S. plants, filed for bankruptcy in 2000.²⁷

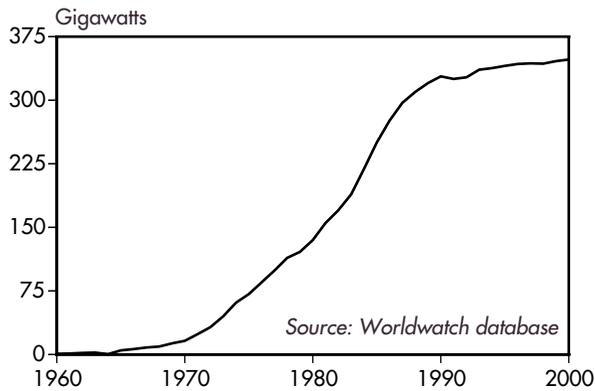


Figure 1: World Electrical Generating Capacity of Nuclear Power Plants, 1960–2000

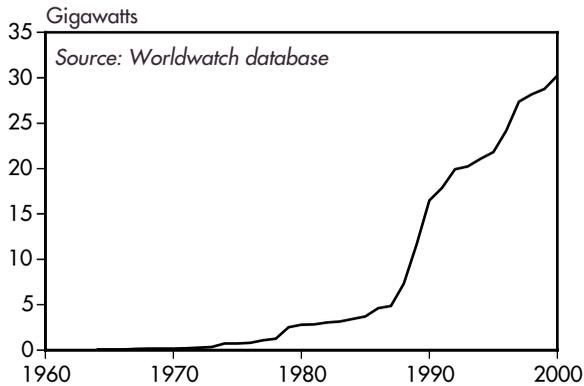


Figure 2: Cumulative Generating Capacity of Closed Nuclear Power Plants, 1964–2000

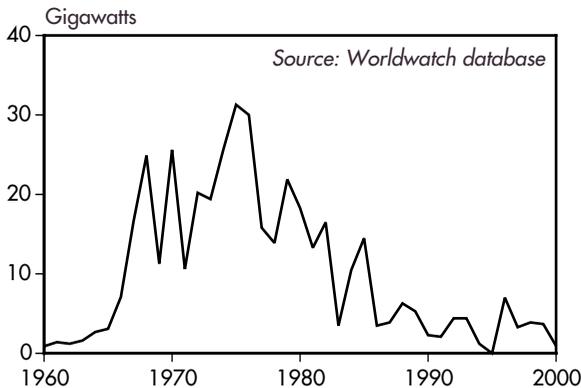


Figure 3: World Nuclear Reactor Construction Starts, 1960–2000

World Net Installed Electrical Generating Capacity of Nuclear Power Plants, 1960–2000

Year	Capacity (gigawatts)
1960	1
1965	5
1970	16
1971	24
1972	32
1973	45
1974	61
1975	71
1976	85
1977	99
1978	114
1979	121
1980	135
1981	155
1982	170
1983	189
1984	219
1985	250
1986	276
1987	297
1988	310
1989	320
1990	328
1991	325
1992	327
1993	336
1994	338
1995	340
1996	343
1997	343
1998	343
1999	346
2000 (prel)	348

Source: Worldwatch Institute database, compiled from the IAEA and press reports.

Wind energy generating capacity reached approximately 18,100 megawatts at the end of 2000, up 30 percent over 1999.¹ (See Figure 1.) Wind power now provides the world with nearly 10 times as much electricity as it did in 1990, although it still accounts for less than 1 percent of the world total.² Yet Germany, whose wind industry was launched in the early 1990s, now gets 2.5 percent of its electricity from the wind, while in Denmark the figure is 13 percent.³ The northernmost German state of Schleswig-Holstein reports a figure of 16.5 percent.⁴

The estimated 4,200 megawatts of wind turbines installed worldwide in 2000 is 7 percent higher than 1999's record-breaking total.⁵ (See Figure 2.) The slower growth in 2000 reflects a severe slump in the U.S. market, which continues to swing widely in response to short-term extensions of a federal wind energy tax credit.⁶ (See Figure 3.) But a record 2,000 megawatts is planned for installation there in 2001, and the industry was buoyed when President George W. Bush proposed extending the wind energy tax credit beyond December 31, 2001.⁷

In 2000, Germany set the current record for annual installations: 1,670 megawatts.⁸ With more than 6,100 megawatts of wind power in place, Germany has over twice as much wind power as any other country, an impressive figure given the fact that the industry there is not yet a decade old.⁹ The year began on a promising note with a strengthened renewable energy law that ensures roughly 8¢ per kilowatt-hour for electricity produced by new wind power installations.¹⁰ Development of the country's offshore potential could help Germany reach its goal of 22,000 megawatts of wind power by 2010.¹¹

Denmark also had its strongest year ever in 2000, with 600 megawatts added, giving this tiny country more than 2,300 megawatts total.¹² The Danish wind industry faces political turbulence, however: the strong market reflected a rush to take advantage of expiring price supports.¹³ The new Danish wind policy is untested, and the risk and uncertainty associated with it have virtually halted new wind energy contracts. Little if any development is

expected in 2001, but long-term prospects for the Danish industry are bright, with much of the focus on large offshore wind projects.¹⁴

Spain's wind industry continued its frenetic growth in 2000, with between 900 and 1,100 megawatts added during the year, pushing total installed capacity to over 2,500 megawatts—trailing only Germany and the United States.¹⁵ From Galicia in the northwest to Andalusia in the south, wind power is now being developed in five Spanish provinces.¹⁶

Italy's wind industry came to life, with 144 megawatts added in 2000, while Greece added 123 megawatts, making them the fifth and sixth largest markets worldwide.¹⁷ France, widely known as Europe's nuclear leader, appears poised to join the wind energy big leagues, with a new renewable energy law and the announcement by Prime Minister Lionel Jospin of plans to add 3,000 megawatts by 2010.¹⁸

Outside of Europe, two countries seemed closer to a self-sustaining wind market in 2000. Following encouraging signs of change in Argentina's policy, Spanish companies announced plans to form a joint venture to develop 3,000 megawatts of wind power in Patagonia.¹⁹ And in China, sizable wind power loans from the Asian Development Bank and the World Bank encouraged NEG Micon, a leading Danish company, to open a new factory near Beijing.²⁰ Still, China's antiquated electricity laws and infighting among government agencies must be overcome before the country's vast wind resources can be tapped.²¹

The end of the year brought further signs that wind power is crossing the threshold to competitiveness with conventional thermal power plants in most parts of the world. A new project at a windy site along the Washington/Oregon border will generate power at less than 3.5¢ per kilowatt-hour.²² Meanwhile, the cost of natural gas-fired power—the dominant source of new electricity in most of Europe and North America—is going up, along with rising fuel costs. Early in 2001, California had to pay 7¢ per kilowatt-hour in order to obtain firm 10-year contracts for power—most of it from existing gas-fired plants.²³

Wind Energy Growth Continues

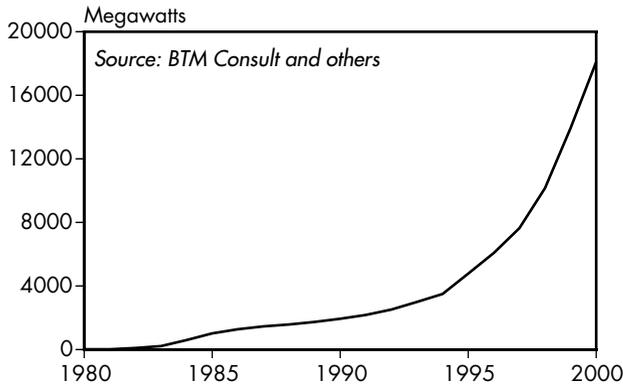


Figure 1: World Wind Energy Generating Capacity, 1980–2000

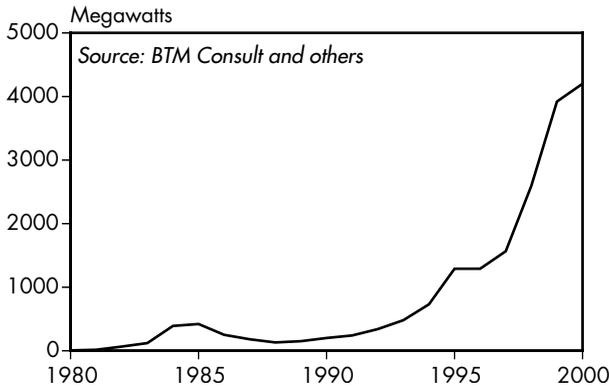


Figure 2: Annual Addition to World Wind Energy Generating Capacity, 1980–2000

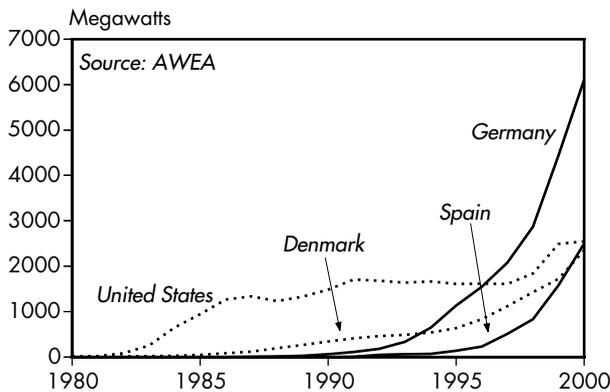


Figure 3: Wind Generating Capacity in Selected Countries, 1980–2000

World Wind Energy Generating Capacity, Total and Annual Addition, 1980–2000

Year	Total	Annual Addition
	(megawatts)	
1980	10	5
1981	25	15
1982	90	65
1983	210	120
1984	600	390
1985	1,020	420
1986	1,270	250
1987	1,450	180
1988	1,580	130
1989	1,730	150
1990	1,930	200
1991	2,170	240
1992	2,510	340
1993	2,990	480
1994	3,490	730
1995	4,780	1,290
1996	6,070	1,290
1997	7,640	1,570
1998	10,150	2,600
1999	13,930	3,920
2000 (prel)	18,100	4,200

Sources: BTM Consult, EWEA, AWEA, *Windpower Monthly*, and *New Energy*.

Production of solar photovoltaic (PV) cells jumped 43 percent in 2000, to an estimated 288 megawatts.¹ (See Figure 1.) Production in 2000 was more than three times higher than in 1996, a year that marked the transition to a period of accelerated growth for the industry—an era that shows every sign of continuing.² In the face of surging demand, factory prices stayed steady at \$3.50 per watt.³ (See Figure 2.)

Government policies are the primary cause for this surge, led by Japan, which increased its lead in the solar power market with production of an estimated 128 megawatts in 2000.⁴ The government expanded subsidies for rooftop solar applications: \$130 million was made available to support one third of the cost of 25,000 new rooftop solar systems, a figure that will increase to \$210 million in 2001.⁵ This level of support, combined with falling PV costs, is projected to double the number of rooftop systems installed in Japan this year.⁶

The Japanese companies Sharp and Kyocera surpassed U.S.-based Solarex to take the top two positions among global manufacturers in 2000.⁷ Sharp, now the leading producer, plans to increase production 70 percent in 2001 to meet the increase in projected demand.⁸ With its home market growing so rapidly, Japanese companies are in good position to extend their command of the technology, expand production quantities, and stretch their market lead over competitors.

U.S. solar production increased more slowly in 2000, reaching 75 megawatts.⁹ Even that growth appears to have been propelled largely by exports to Europe and Japan; the U.S. domestic market remains weak, despite the country's size, wealth, and abundance of sunny regions that are ideally suited for solar power.¹⁰ The Million Solar Roofs Initiative announced in 1997 has not been backed by any significant financial support, and its loose collection of low-interest loans, state pricing laws, and public-private partnerships has failed to ignite a surge in PV installations.¹¹

In California, hit hard by soaring electricity prices and rolling blackouts, the Los Angeles Department of Water and Power has estab-

lished a \$75-million budget to support as many as 100,000 solar rooftop installations over the next five years.¹²

The European outlook is brighter. PV production reached 61 megawatts in 2000, an increase of 52 percent over 1999.¹³ The European solar industry is being led by Germany, which launched its own 100,000 rooftop program in late 1998.¹⁴ That program—which includes a 10-year, interest-free loan from the German Federal Bank plus a guaranteed purchase price of 50¢ per kilowatt-hour—resulted in 45 megawatts of new installations in 2000.¹⁵ In fact, strong interest in the program forced the government to reduce the level of incentives midway through 2000.¹⁶ Continued strong growth is under way in 2001.

The most important application for solar PVs is in rural areas of developing countries, where billions of people are still not connected to electric lines. Despite the valiant efforts of governments and international agencies such as the Global Environment Facility, however, solar energy remains a “rich man's” power source.¹⁷ In 1999, only about 45 megawatts—less than one quarter of the world's production—was installed in off-grid areas of Africa, Asia, and Latin America, a number that appears to have increased only modestly in 2000.¹⁸

The greatest barrier to developing-country use of PVs is cost: solar cells are capital-intensive, and rural areas are generally cash-poor. In addition, developing countries face the challenge of building the infrastructure to install and maintain PV systems.

Government subsidies and low-interest loans or lease plans are among the strategies that have proved effective in spreading PVs in some developing countries.

In South Africa, the planned installation of 350,000 solar home systems is a central part of the country's post-apartheid effort to provide electricity in rural areas.¹⁹ In 1999, for example, President Nelson Mandela helped launch a program in the Eastern Cape for the local utility to install 50,000 50-watt systems, charging villagers \$30 for installation and an \$8 monthly service fee.²⁰

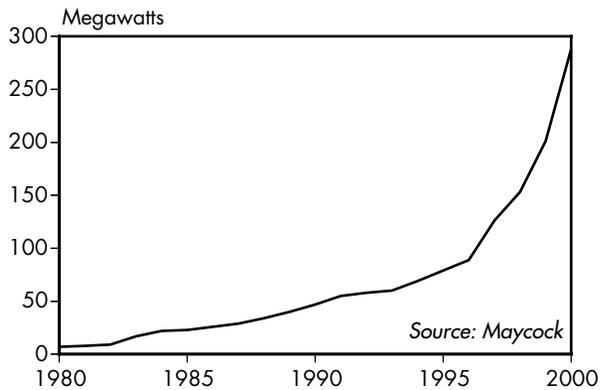


Figure 1: World Photovoltaic Production, 1980–2000

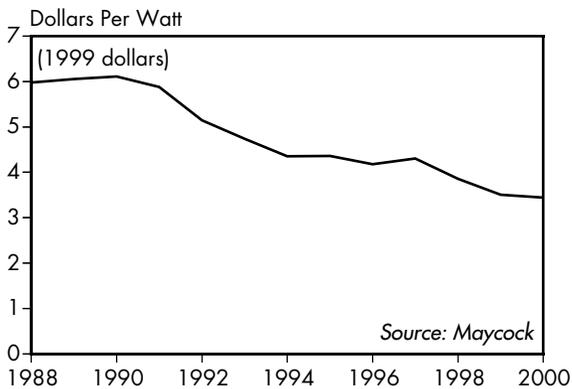


Figure 2: Average World Wholesale Price for Photovoltaic Modules, 1988–2000

World Photovoltaic Production, 1980–2000

Year	Production (megawatts)
1980	7
1981	8
1982	9
1983	17
1984	22
1985	23
1986	26
1987	29
1988	34
1989	40
1990	46
1991	55
1992	58
1993	60
1994	69
1995	79
1996	89
1997	126
1998	153
1999	201
2000 (prel)	288

Source: Paul Maycock, *PV News*, various issues.

Atmospheric Trends

PHOTOGRAPH BY DON HINRICHSEN. M/MC PHOTOSHARE, WWW.JHUCCP.ORG/MMC



Global Temperature Steady
Carbon Emissions Continue Decline

The average temperature of the atmosphere at Earth's surface held at 14.36 degrees Celsius, according to data from the Goddard Institute for Space Studies at the National Aeronautics and Space Administration (NASA). (See Figure 1.)¹ This makes the past two years the sixth and seventh warmest in this NASA dataset, which is based on land- and ocean-based measurements and dates back to 1950.²

An older NASA dataset, based only on meteorological stations and extending back to 1867, showed a slight drop to 14.35 degrees, making 2000 the ninth warmest year on record. (See Figure 2.)³ In both datasets, the 10 warmest years have occurred since 1980.⁴

Links:
pp. 52, 92

Global temperatures were influenced by the year-long presence of La Niña—a cooling phenomenon that originates in the Pacific Ocean but has a worldwide influence—that began strongly but weakened in July and August.⁵ This contributed to lower-than-normal temperatures in the equatorial Pacific and in the tropics overall.⁶ In the nontropical northern hemisphere, however, temperatures north of 20 degrees latitude were the third warmest among records dating back to 1880, which are kept by the National Oceanic and Atmospheric Administration (NOAA).⁷ Canada, Scandinavia, and Eastern Europe experienced annual average temperatures that were more than 1 degree above their historical average.⁸

NOAA estimates that global temperatures in 2000 were 0.39 degrees above the long-term mean.⁹ While global surface temperatures increased by about 0.6 degrees in the last century, during the last 25 years the rate neared 0.2 degrees per decade.¹⁰

NOAA satellites are used by NASA and the University of Alabama-Huntsville to measure temperatures in the lower troposphere, the bottom eight kilometers of Earth's atmosphere.¹¹ These measurements, dating back to 1979, indicate an increase of only 0.04 degrees Celsius per decade in the troposphere—one fifth the rate shown at the surface.¹² But data from NOAA, using measurements from instrumented balloons, show similar increases in lower tropo-

spheric and surface temperatures: 0.09 and 0.1 degrees, respectively, per decade since 1958.¹³

In January 2001, the Intergovernmental Panel on Climate Change (IPCC), a U.N.-led international network of hundreds of scientists, released a draft summary of its Third Assessment Report.¹⁴ The panel concludes that “there is new and stronger evidence that most of the warming observed over the last 50 years is attributable to human activities.”¹⁵

It projects a rate of warming that is much higher than that observed during the twentieth century, and that is probably “without precedent” during at least the last 10,000 years.¹⁶

The IPCC has revised upward its 1995 scenarios for surface temperature change, due to an anticipated drop in sulfur emissions, which cause a temporary atmospheric cooling.¹⁷ Temperatures are projected to increase by 1.4–5.8 degrees between 1990 and 2100, compared with the previous estimate of 1–3.5 degrees.¹⁸ Improved models also indicate a smaller melting of glaciers and ice sheets, lowering sea level rise projections to 9–88 centimeters by 2100, versus 13–94 centimeters in the 1995 assessment.¹⁹

Higher surface temperatures are projected to increase global average precipitation, but with varying regional increases and decreases.²⁰ Higher maximum and minimum temperatures, with more hot days and fewer cold days, are “very likely” to occur over nearly all land areas.²¹ Also very likely are reduced temperature ranges and an increase in the heat index over “most” land areas, and more intense precipitation events over “many” land areas.²²

Nearly all land areas are likely to warm more rapidly than the global average: the projected warming in northern North America and northern and Central Asia exceeds the global mean by more than 40 percent.²³ A U.S. assessment projects that average U.S. temperatures will increase by 3–5 degrees Celsius by 2100.²⁴ Precipitation in the United States, which has already risen by 5–10 percent, is expected to become more extreme, combining with increased evaporation to make both drier and wetter events more frequent.²⁵

Global Temperature Steady

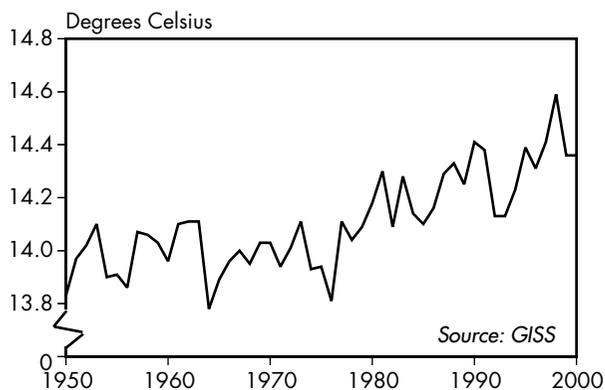


Figure 1: Global Average Temperature at Earth's Surface, 1950–2000

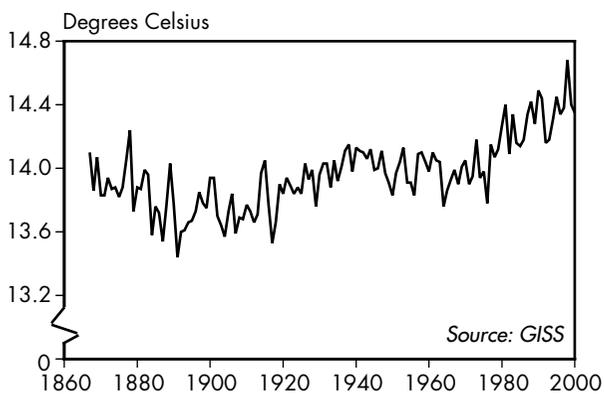


Figure 2: Global Average Temperature at Earth's Surface (Land-Based Series), 1867–2000

Global Average Temperature, 1950–2000

Year	Temperature (degrees Celsius)
1950	13.83
1955	13.91
1960	13.96
1965	13.89
1970	14.03
1971	13.94
1972	14.01
1973	14.11
1974	13.93
1975	13.94
1976	13.81
1977	14.11
1978	14.04
1979	14.09
1980	14.18
1981	14.30
1982	14.09
1983	14.28
1984	14.14
1985	14.10
1986	14.16
1987	14.29
1988	14.33
1989	14.25
1990	14.41
1991	14.38
1992	14.13
1993	14.13
1994	14.23
1995	14.39
1996	14.31
1997	14.41
1998	14.59
1999	14.36
2000 (prel)	14.36

Source: Surface Air Temperature Analysis, Goddard Institute for Space Studies, 19 January 2001.

Global carbon emissions from fossil fuel combustion fell for the third consecutive year, by 0.6 percent, to just below 6.3 billion tons.¹ (See Figure 1.) Since 1950, some 217 billion tons of carbon have been released to the atmosphere, with annual emissions nearly quadrupling over this period.²

The amount of carbon emitted per unit of global economic output continued to drop, by 3.6 percent, to 148 tons per million dollars of gross world product (GWP).³ (See Figure 2.) The carbon/GWP ratio has declined by approximately 41 percent over the past half-century, reflecting improvements in efficiency and an ongoing transition to lower-carbon fuels.⁴

Link: p. 50

Under the Kyoto Protocol to the U.N. Framework Convention on Climate Change, industrial and former Eastern bloc nations (called Annex I countries) are committed to collectively reducing their emissions of carbon and other greenhouse gases by 5.2 percent below 1990 levels by 2008–12.⁵ By the end of 2000, these nations were 2.6 percent below the 1990 mark for carbon, largely because of a 33.2-percent reduction in former Eastern bloc nations, which are permitted under the Protocol to return emissions to 1990 levels.⁶

Western industrial nations, on the other hand, have increased carbon emissions by 9.2 percent since 1990.⁷ The United States, which accounts for 24 percent of global emissions and agreed in Kyoto to a 7-percent cut, now stands at about 13 percent above 1990 levels.⁸ The European Union, which agreed to an 8-percent cut, is 0.5 percent below 1990 levels.⁹ Japan, due for a 6-percent reduction, is 2.7 percent above the 1990 mark.¹⁰

In developing nations, carbon emissions have grown by 22.8 percent since 1990.¹¹ But progress is being made in reducing carbon/gross domestic product (GDP) trends—arguably a better way to measure these nations' efforts to “decarbonize” economic development. China, India, and Brazil all have carbon/GDP indicators below that of the United States.¹²

Atmospheric carbon dioxide (CO₂) levels climbed to 369.4 parts per million volume

(ppmv).¹³ (See Figure 3.) Current concentrations have not been exceeded for at least 420,000 years, and probably during the last 20 million years, and have risen by 31 percent since 1750.¹⁴ The rate of increase of atmospheric CO₂ levels, unprecedented for at least 20,000 years, has averaged close to 0.4 percent for the past two decades, with a 0.8-percent average rise during the 1990s.¹⁵

CO₂ is one of several greenhouse gases driving temperature and climate change at Earth's surface. Scientists have pointed out that non-CO₂ gases, such as chlorofluorocarbons, methane, and nitrous oxide, have as a group been the main drivers of the warming of recent decades.¹⁶ But they also note that CO₂ remains the single most important gas: its estimated warming effect is twice that of the second most significant greenhouse gas, methane.¹⁷ The importance of reducing carbon emissions will grow, moreover, as emissions of offsetting atmosphere-cooling aerosols are cut.¹⁸

Under the latest scenarios from the Intergovernmental Panel on Climate Change, annual carbon emissions from fossil fuel burning are projected to reach 9–12.1 billion tons by 2020.¹⁹ By 2050, emissions will range from 11.2 billion to 23.1 billion tons.²⁰

For the Kyoto Protocol to enter into force, it must be ratified by 55 nations, including those representing 55 percent of Annex I emissions.²¹ As of late 2000, 30 nations had ratified the treaty.²² But most countries, including the United States, are waiting for the specific details of the pact to be worked out.²³

Representatives from 182 governments, meeting in the Hague in November 2000, failed to reach agreement on finalizing the Kyoto rules.²⁴ Major points of difference, primarily between the United States and the European Union, involved the extent to which countries can meet their commitments through international emissions trading and the counting of “sinks” through agricultural and forest practices.²⁵ The next full round of climate negotiations will take place October 29–November 9, 2001, in Marrakesh, Morocco.²⁶

Carbon Emissions Continue Decline

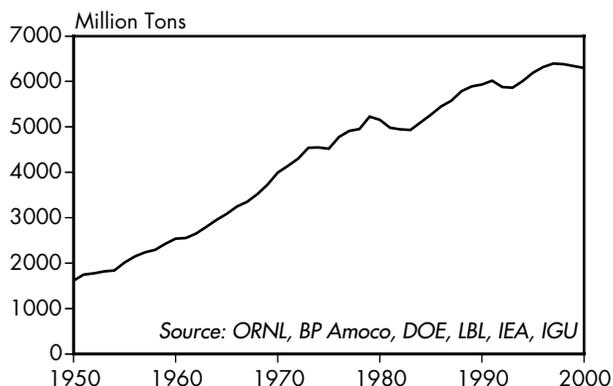


Figure 1: World Carbon Emissions from Fossil Fuel Burning, 1950-2000

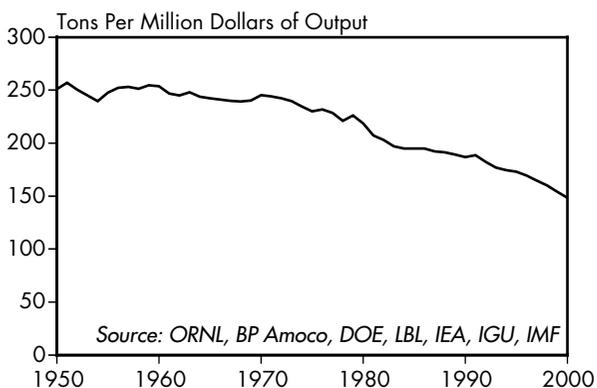


Figure 2: Carbon Intensity of the World Economy, 1950-2000

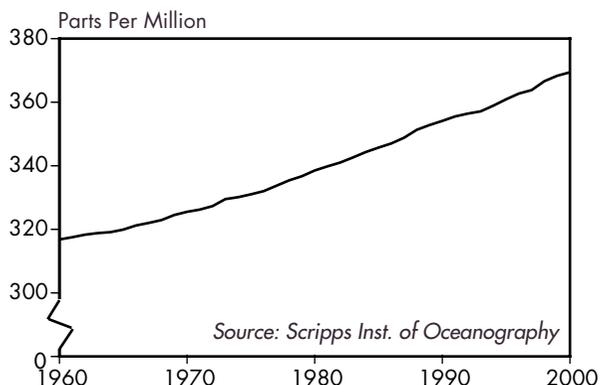


Figure 3: Atmospheric Concentrations of Carbon Dioxide, 1960-2000

World Carbon Emissions from Fossil Fuel Burning, 1950-2000, and Atmospheric Concentrations of Carbon Dioxide, 1960-2000

Year	Emissions (mill. tons of carbon)	Carbon Dioxide (parts per mill.)
1950	1,612	n.a.
1955	2,013	n.a.
1960	2,535	316.7
1965	3,087	319.9
1970	3,997	325.5
1971	4,143	326.2
1972	4,305	327.3
1973	4,538	329.5
1974	4,545	330.1
1975	4,518	331.0
1976	4,776	332.0
1977	4,910	333.7
1978	4,950	335.3
1979	5,229	336.7
1980	5,155	338.5
1981	4,984	339.8
1982	4,947	341.0
1983	4,933	342.6
1984	5,098	344.2
1985	5,271	345.7
1986	5,453	347.0
1987	5,574	348.7
1988	5,789	351.3
1989	5,892	352.7
1990	5,931	354.0
1991	6,020	355.5
1992	5,879	356.4
1993	5,861	357.0
1994	6,013	358.9
1995	6,190	360.9
1996	6,315	362.6
1997	6,395	363.8
1998	6,381	366.6
1999	6,340	368.3
2000 (prel)	6,299	369.4

Source: Worldwatch estimates based on ORNL, BP Amoco, DOE, LBL, IEA, IGU, and Scripps.

Economic Trends

PHOTOGRAPH BY KLAUS ANDREWS/PETER ARNOLD, INC.



World Economy Expands
Foreign Debt Unchanged
U.N. Funds Stay on Roller Coaster
Food Trade Slumps
Aluminum Production Keeps Growing

The global economy in 2000 expanded by 4.7 percent, the most in many years and well above the 1999 growth of 3.4 percent.¹ (See Figure 1.) The output in goods and services of \$43 trillion lifted average output per person for the world's 6 billion people to \$7,102.² (See Figure 2.)

This economic expansion was fed by a strong U.S. economy, an upswing in economic activity in Europe, continuing recovery in Asia from the 1997 financial crisis, a strong recovery in Latin America from the crisis of 1998, and a marked improvement in the transition economies.³

The North American economy was particularly strong, leading all other industrial regions.

Links:
pp. 58, 112

The United States, with a 5.2-percent expansion in 2000—up from 4.2 percent in 1999—continued the longest economic expansion in its history.⁴ Canada, with an unusually strong performance as well, grew by 4.7 percent.⁵

Western Europe also registered a hefty performance in 2000. Growth of the European Union economies was an unusually robust 3.4 percent, up from 2.4 percent in 1999.⁶ Growth in the four largest industrial economies ranged around 3 percent or higher, with Germany recording a growth of 2.9 percent, Italy and the United Kingdom 3.1 percent, and France 3.5 percent.⁷ Ireland continued as the region's "tiger" economy, expanding by 8.7 percent.⁸

Asia expanded at 6.7 percent in 2000, up from 5.9 in 1999 and 4.1 percent the preceding year.⁹ China's economy again led the region, growing 7.5 percent.¹⁰

The Indian subcontinent expanded by over 6 percent in 2000.¹¹ India's economy grew by 6.7 percent, followed by Pakistan at 5.6 percent, and Bangladesh at an even 5 percent.¹² This continuing strong economic performance of the region, which sadly has a large share of the 1.2 billion people in the world who live on \$1 a day or less, is a welcome development.¹³ Record wheat and rice crops helped reinforce the economic expansion.¹⁴

The southeast Asian economies, all recovering from 1997's financial crisis, were mostly expanding at 4–5 percent.¹⁵ Included in this group were Indonesia, the Philippines, Thai-

land, and Viet Nam.¹⁶

Perhaps the biggest surprise of 2000 was the strong expansion of the transition economies, notably the 7-percent growth of the Russian economy.¹⁷ Fueled by higher energy prices and renewed confidence, the Russian expansion was up from 3.2 percent in 1999, and from a shrinkage of 4.9 percent in 1998.¹⁸ Higher export prices for oil and natural gas underpinned the strongest expansion in the Russian economy in at least a decade.¹⁹ Eastern Europe's growth of roughly 4 percent was led by Hungary at 5.5 percent and Poland at 5 percent.²⁰

Latin America bounced back from a shrinkage of 0.3 percent in 1999 to a strong 4.3-percent expansion in 2000.²¹ Among the leaders were Mexico at 6.5 percent, which benefited from higher oil prices; Chile at 6 percent; and Brazil at 4 percent.²²

In the Middle East, the 4.8-percent expansion in 2000 was nearly double the 2.8 percent of the preceding year.²³ Higher oil prices stimulated several economies in the region. The Saudi economy, for example, which had declined by 1 percent in 1999, grew by 3.5 percent in 2000.²⁴ Egypt continued at a strong pace with a 5-percent expansion.²⁵ Iran increased its overall economic output by 3.4 percent, despite having its agriculture decimated by one of the most severe droughts in decades.²⁶

Africa's economy expanded at 3.4 percent in 2000, compared with 2.2 percent the year before.²⁷ Among its economies growing at 5 percent or more were Tanzania, Tunisia, and Uganda.²⁸ Nigeria, the most populous country in the region, grew 3.5 percent in 2000, up from 1.1 percent in 1999.²⁹ It benefited from both mounting confidence inspired by new leadership and higher oil prices. South Africa, the largest economy in the region, also picked up, expanding 3 percent in 2000, compared with 1.2 percent the year before.³⁰

As of late 2000, the International Monetary Fund projects that global economic growth will continue in 2001 but at a somewhat slower rate.³¹ The expansion in all regions is projected to slow except for Latin America, which is expected to grow even faster in 2001.³²

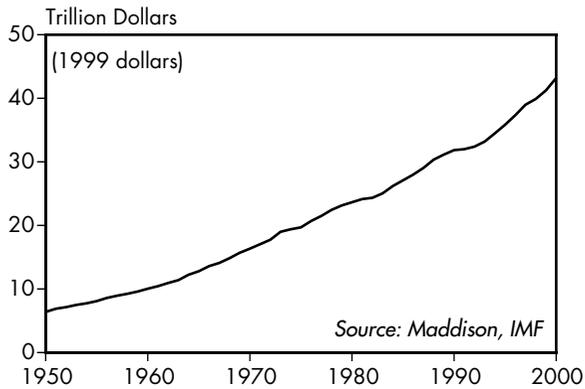


Figure 1: Gross World Product, 1950–2000

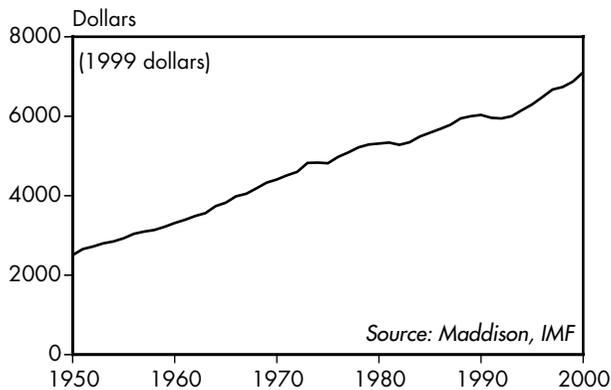


Figure 2: Gross World Product Per Person, 1950–2000

Gross World Product, 1950–2000

Year	Total (trill. 1999 dollars)	Per Person (1999 dollars)
1950	6.4	2,502
1955	8.1	2,921
1960	10.0	3,306
1965	12.8	3,822
1970	16.3	4,407
1971	17.1	4,505
1972	17.8	4,599
1973	19.0	4,819
1974	19.4	4,829
1975	19.7	4,816
1976	20.7	4,977
1977	21.5	5,083
1978	22.4	5,210
1979	23.1	5,282
1980	23.6	5,306
1981	24.2	5,329
1982	24.4	5,280
1983	25.1	5,341
1984	26.2	5,485
1985	27.1	5,582
1986	28.0	5,673
1987	29.0	5,778
1988	30.3	5,938
1989	31.2	5,996
1990	31.9	6,031
1991	32.0	5,957
1992	32.4	5,941
1993	33.2	6,000
1994	34.5	6,150
1995	35.8	6,295
1996	37.3	6,475
1997	39.0	6,666
1998	39.9	6,732
1999	41.2	6,871
2000 (prel)	43.2	7,102

Sources: Worldwatch update of Angus Maddison, *Monitoring the World Economy 1820–1992* (Paris: OECD, 1995); updates from IMF, *World Economic Outlook* tables.

The accumulated foreign debt of developing and former Eastern bloc nations, having posted its largest increase in history during 1998, was essentially unchanged in 1999. It fell slightly after adjusting for inflation, at \$2.57 trillion (in 1999 dollars).¹ (See Figure 1.) Governments in borrowing nations owed or guaranteed 81 percent of this debt.² (In the latter case, they promise to repay the lender if a domestic borrower, such as an electric utility, does not.)

Financial crises in 1997 and 1998 in such nations as Brazil, Indonesia, Russia, and South Korea largely explain overall debt trends since 1996. Back then, 21 percent of the debt owed by developing and former Eastern bloc nations was short-term, lent for at most one year.³ But then creditors became less willing to grant new short-term loans, so as old ones expired, their share of outstanding debt plunged to 16 percent in 1998 and 1999.⁴ Cumulative short-term debt shrank from \$480 billion at the end of 1997 to \$410 billion at the end of 1999.⁵

But total long-term debt owed to private investors jumped a record \$190 billion in 1998, to \$1.22 trillion—as creditors granted more in new long-term loans than they received in repayment on old ones—and then held steady in 1999.⁶ High interest rates promised by countries desperate for foreign exchange enticed some banks and investors to lend more. Other creditors turned their short-term loans into long-term ones, recognizing that prompt repayment was impossible.

Loans from government agencies, mostly in rich industrial nations, also rose after 1997.⁷ Cumulative debt owed to aid and export financing agencies inched up from \$520 billion in 1997 to \$530 billion in 1999.⁸ And debts owed to international agencies swelled from \$370 billion to \$430 billion as the World Bank and the International Monetary Fund financed huge “bailout packages” in crisis countries.⁹

Ideally, long-term lending supports projects, from public railroad construction to small business expansion, that generate enough income to more than repay the loans. In South Korea, for example, foreign lending has been an important source of capital for rapid economic

development and poverty reduction, despite occasional debt crises.¹⁰ Worldwide, however, foreign funds have too often been used poorly—supporting arms buying, corruption, capital flight, and prestige projects (such as unneeded airports), as well as projects that worked better on paper than in practice.¹¹

These uses do double damage. First, they often exacerbate inequities in wealth and power and waste opportunities for economic development. Second, as borrowing escalates, creditors eventually lose faith in a country's ability to repay, and they cease lending, often triggering financial crisis and recession. During the global debt crisis that began in 1982, wages fell by half in Mexico.¹² In the Philippines, poverty sent a million hungry peasants into the mountains, where they cleared protective trees from erodible slopes in order to farm.¹³

One indicator of ability to handle debt is a country's debt-to-gross-national-product ratio. At the height of the 1980s debt crisis, this exceeded 60 percent in Latin America.¹⁴ (See Figure 2.) In the 1990s, the ratio has climbed above 70 percent in sub-Saharan Africa—and above 100 percent if South Africa is excluded.¹⁵

In response to pressure from nongovernmental groups in creditor and debtor nations, industrial governments and international lenders have slowly written off some of Africa's debts.¹⁶ The latest debt cancellation program, the enhanced Heavily Indebted Poor Countries initiative announced in 1999, aims to cut by about 45 percent the cumulative debt of 41 of the poorest, most indebted nations, 33 of which are in Africa.¹⁷ The initiative takes an important step toward resolving the debt troubles of the poorest nations. But it will probably not prevent future crises, for it does little to change the systems that create the crisis in the first place. Export credit agencies, for example, lend to poor countries for reasons that have little to do with development. And even agencies intent on helping borrowers are insulated from the consequences of their actions, which gives freer play to bureaucratic tendencies toward the pursuit of growth in lending for its own sake and corruption.¹⁸

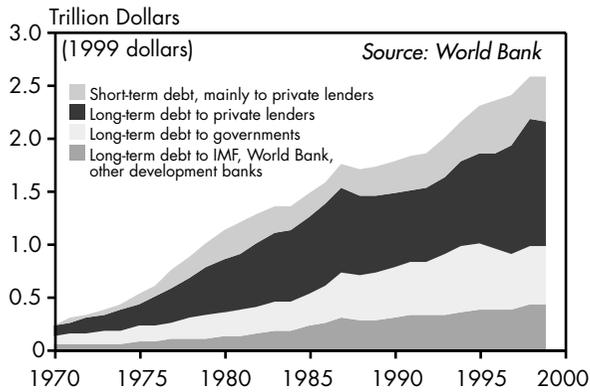


Figure 1: Foreign Debt of Developing and Former Eastern Bloc Nations, 1970–99

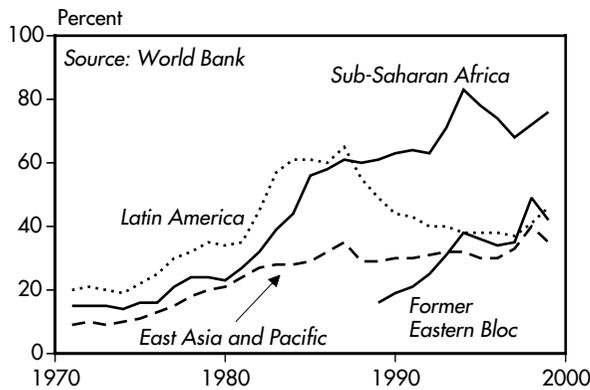


Figure 2: Ratio of Foreign Debt to Gross National Product, Selected Regions, 1971–99

Foreign Debt of Developing and Former Eastern Bloc Nations, 1970–99

	Total (trill. 1999 dollars)
1970	0.26
1971	0.29
1972	0.32
1973	0.37
1974	0.42
1975	0.51
1976	0.59
1977	0.74
1978	0.86
1979	0.98
1980	1.07
1981	1.18
1982	1.23
1983	1.33
1984	1.35
1985	1.47
1986	1.57
1987	1.73
1988	1.68
1989	1.70
1990	1.77
1991	1.80
1992	1.85
1993	1.97
1994	2.15
1995	2.30
1996	2.35
1997	2.40
1998	2.61
1999	2.57

Source: World Bank, *Global Development Finance 2000*, electronic database, 2000.

Funding for the United Nations has been on a roller coaster. The total amount of money available rose slightly in 1999 to \$10.6 billion (the most recent year for which complete budget information is available), but is down more than 5 percent from the 1992 peak of \$11.2 billion.¹ (See Figure 1.)

About \$1.2 billion of this money is available for the U.N. regular budget, which supports headquarters in New York; offices in Geneva, Vienna, and Nairobi; and five regional commissions. This component, which is paid for by assessments levied on each member state, has seen little growth for the past decade—largely at the urging of the United States.²

A far larger chunk of money—some \$9.3 billion in 1999—goes to an array of specialized U.N. agencies and organs.³ Among these, 12 agencies are funded both through annual budget assessments and through voluntary contributions from member states, to the tune of about \$3 billion a year.⁴ Prominent among them are the Food and Agriculture Organization (FAO), the International Labour Organization (ILO), and the World Health Organization (WHO).⁵ Another 12 U.N. bodies, known as special organs, are supported through voluntary funds only. This group includes the U.N. Development Programme, U.N. Environment Programme, U.N. High Commissioner for Refugees, UNICEF, and the World Food Programme. In 1999, a total of \$6.4 billion was available to the special organs.⁶

Voluntary contributions accounted for 81 percent of the funds of all U.N. agencies and organs in 1999, and about 72 percent of total U.N. system funds.⁷ (See Figure 2). But voluntary funding has also been extremely volatile, causing unexpected budget shortfalls in some years and making long-term planning exceedingly difficult.

In theory, assessed budgets offer more predictability, but, particularly since the mid-1980s, many member states have failed to pay their share of the budget in full and on time. Only in the last few years have payment habits improved again. U.N. members are expected to pay their regular budget dues within the first

30 days of each calendar year. In 1991, only 9 countries (accounting for 8 percent of the regular budget) lived up to this obligation.⁸ By 2001, 40 countries (covering 18 percent of the budget) made this U.N. “honor roll.”⁹ Seven nations—Canada, Denmark, Finland, Ireland, Liechtenstein, New Zealand, and Sweden—have paid promptly every year since 1991.¹⁰

Many nations pay late; others build up arrears. The portion of regular budget dues paid by 30 September each year rose from 58 percent in 1994 to 67 percent in 1999.¹¹ Likewise, by the end of September, U.N. agencies receive on average about two thirds of the money that member governments owe in a calendar year.¹² But the record varies sharply from year to year and from agency to agency. The more technically oriented agencies—the International Telecommunication Union, the Universal Postal Union, the World Intellectual Property Organization, and the International Maritime Organization—have fared far better, with 83–93 percent of dues collected.¹³

U.N. member states’ arrears on their regular budget dues have fallen sharply—from \$602 million in 1995 to \$219 million in 2000.¹⁴ (See Figure 3.) Meanwhile, arrears on membership dues for U.N. agencies also dropped, from \$1.4 billion in 1996 to \$1.2 billion in 1999.¹⁵

The United States is both the largest financial contributor to the U.N. system and its largest debtor, accounting for roughly three quarters of regular budget arrears. The reduction of the U.S. share of the regular budget from 25 to 22 percent (approved by the U.N. General Assembly in December 2000 after some high-stakes arm-twisting by the U.S. Congress) raises hopes for a more responsible U.S. policy.¹⁶ Even so, Congress has attached a series of conditions before it will authorize payment of past debts. Among them is a demand that the FAO, ILO, and WHO adopt no-growth budgets.¹⁷ Thus in exchange for settling past debts, these agencies risk being shackled in their future operations.

U.N. Funds Stay on Roller Coaster

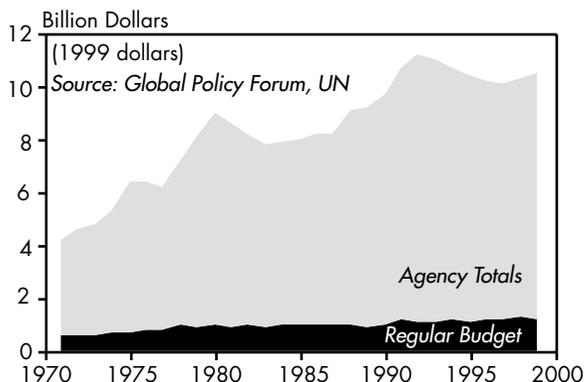


Figure 1: Total Funds Available to U.N. System, 1971-99

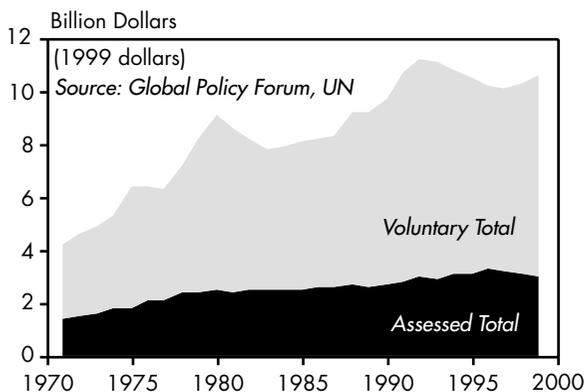


Figure 2: Assessed Budgets and Voluntary Contributions to the U.N. System, 1971-99

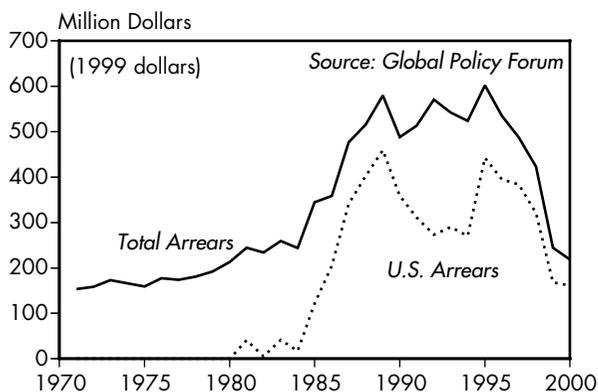


Figure 3: Total and U.S. Arrears on Regular U.N. Budget, 1971-2000

Total Funds Available to U.N. System, 1971-99

Year	Regular Budget	Agency Totals
(bill. 1999 dollars)		
1971	0.6	3.6
1972	0.6	4.0
1973	0.6	4.0
1974	0.8	4.5
1975	0.7	5.6
1976	0.8	5.5
1977	0.8	5.5
1978	1.0	6.1
1979	0.9	7.2
1980	1.0	8.0
1981	0.9	7.7
1982	1.0	7.1
1983	1.0	6.8
1984	1.0	6.9
1985	1.0	7.0
1986	1.0	7.2
1987	1.0	7.3
1988	1.0	8.2
1989	1.0	8.2
1990	1.0	8.7
1991	1.1	9.5
1992	1.1	10.0
1993	1.1	9.9
1994	1.2	9.5
1995	1.2	9.3
1996	1.2	9.0
1997	1.2	9.0
1998	1.3	9.0
1999	1.2	9.3

Sources: Global Policy Forum, U.N. General Assembly, and UNDP/U.N. Population Fund.

Global trade in food and agricultural products stood at \$417 billion in 1999, 15 percent below the high of \$488 billion in 1996 (in 1999 dollars).¹ (See Figure 1.) Still, as all nations depend increasingly on food brought from farther away, food trade has grown nearly threefold since 1961, doubling just since 1970.²

Food trade soared following World War II, as the introduction of industrial farm practices quickly generated exportable surpluses and as diplomatic relations came to include economic ties. Many nations launched export-oriented agricultural strategies in the 1970s.³

A global farm crisis of high farmer debt and extremely low commodity prices in the 1980s sent food trade into severe decline until the early 1990s.⁴ Agriculture was partly opened to World Trade Organization rules in 1994; since then, 20- and 30-year lows for major agricultural commodity prices have cut the value of food trade.⁵

Agricultural products once dominated world trade, accounting for 47 percent of all exports in 1950.⁶ But as manufactured and mined goods have grown in importance, agriculture's share dropped to 10 percent by 1999.⁷ For certain regions, the figure is higher: 14 percent of sub-Saharan Africa's exports are agricultural, as are 22 percent of those from Latin America and the Caribbean.⁸

The developing world is a net importer of basic food stuffs, such as grain and meat, although it is a net exporter of many cash crops, including bananas, sugarcane, coffee, and cocoa.⁹ Still, most food consumed in the world is produced domestically. Cereal exports, for instance, represent just 13 percent of global cereal production.¹⁰ Yet wealthy and densely populated nations, such as South Korea and Japan, import 70–75 percent of their grain; as a region, North Africa and the Middle East imports half of its grain.¹¹

As the value of agricultural trade has increased, so has the volume. Today, some 650 million tons of food are shipped around the planet each year—up fourfold from 165 million tons in 1961.¹² Most of this travels by boat,

although high-value items such as cut flowers or frozen produce are increasingly shipped by refrigerated plane.¹³

At 280 million tons, cereal products account for at least 40 percent of total shipments, while fruits and vegetables are the second biggest category, at 114 million tons.¹⁴ (See Figure 2.) The vast majority of internationally traded cereals and oilseeds end up in livestock feedlots of the industrial world.¹⁵

In contrast, luxury items with substantially less nutritional value than staples command a disproportionately large share of value. (See Figure 3.) For example, at \$57 billion, trade in coffee, cocoa, wine, and tobacco is worth more than all cereals trade.¹⁶

A relatively small number of nations and companies control exports for most major commodities. The five biggest exporters—Argentina, Australia, Canada, France, and the United States—ship 70 percent of the world's grain, while the United States alone exports two thirds of the world's corn.¹⁷ The top five cocoa exporters account for 83 percent of cocoa trade, with Côte d'Ivoire responsible for nearly half.¹⁸

According to a recent study, a handful of transnational firms control about 90 percent of the global trade in wheat, maize, coffee, cocoa, and pineapple; 70 percent of the global tea, banana, and rice markets; and more than 60 percent of the world trade in sugar—giving these firms great control over prices.¹⁹ Cargill alone controls an estimated 50 percent of all grain shipped around the globe.²⁰

While food trade can generate much-needed foreign exchange, profits generated by traders often do not trickle down to farmers, and cheap imports can squash local markets, exacerbating poverty and hunger.²¹

As agriculture is integrated into the global economy, the distance from farmer to consumer grows, even when food can be grown locally. For instance, food consumed in the United Kingdom travels 50 percent more on average than two decades ago.²² While this may offer greater variety to the global consumer, it also uses large amounts of energy, generates excess packaging and pollution, and can reduce food quality.²³

Links: pp. 28, 120, 122

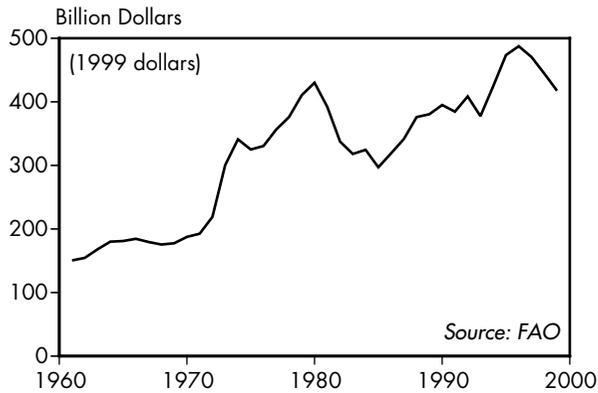


Figure 1: World Agricultural Trade, 1961-99

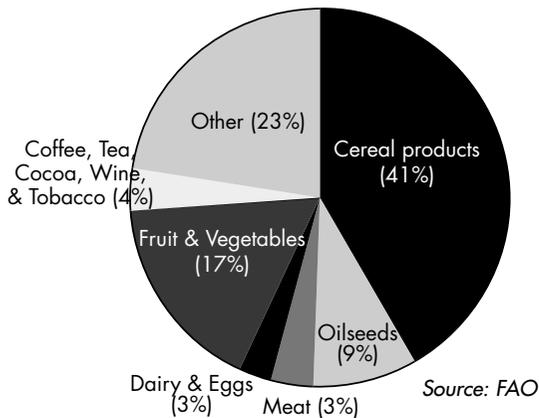


Figure 2: World Trade Categories by Volume, 1999

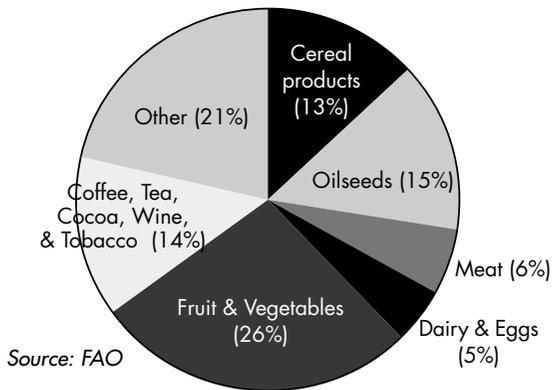


Figure 3: World Trade Categories by Value, 1999

World Agricultural Trade, 1961-99

Year	Total (billion 1999 dollars)
1961	150.4
1962	154.4
1963	167.9
1964	180.1
1965	180.8
1966	184.6
1967	179.7
1968	175.5
1969	177.7
1970	187.7
1971	192.4
1972	219.1
1973	300.6
1974	341.0
1975	325.0
1976	330.4
1977	356.6
1978	375.9
1979	410.3
1980	430.1
1981	392.1
1982	337.4
1983	318.0
1984	324.3
1985	297.0
1986	319.0
1987	341.7
1988	376.1
1989	380.5
1990	395.0
1991	384.5
1992	408.3
1993	377.6
1994	424.4
1995	473.3
1996	487.7
1997	470.6
1998	444.6
1999	417.3

Source: FAO, FAOSTAT Statistics Database, <apps.fao.org>, updated 27 October 2000.

In 2000, estimated world production of primary aluminum (metal made from bauxite ore, rather than recycled) was at a record 23.9 million tons, 3 percent more than in 1999.¹ (See Figure 1.) Sixteen times as much of this light metal is now produced as in 1950.² World average production per person has risen from 0.6 to 3.9 kilograms over the same period.³ And in 2000, some 127 million tons of bauxite were mined worldwide, at least three fourths of which was refined into alumina (aluminum oxide) for aluminum production.⁴

The United States, Russia, China, Canada, and Australia account for more than half of world primary aluminum production.⁵ The United States is the leader, with 15 percent of world output in 2000, but it no longer dominates the industry as it did a few decades ago.⁶

Production of secondary, or recycled, aluminum has grown sharply since the 1960s. In 1999, the latest year with data, secondary production was 7.9 million tons—18 times more than in 1950.⁷ (See Figure 2.) Probably two thirds or more of that amount, however, was made from aluminum-industry production scrap rather than from used, or “post-consumer,” products.⁸ In 1999, the United States recycled about 3.5 million tons of metal, nearly half the world total, but only 40 percent of that was post-consumer material.⁹

Aluminum is light, strong, easily worked, corrosion-resistant, and a good conductor of heat and electricity. This combination of qualities has made it ubiquitous and essential in industrial economies. It is particularly important in transportation, where weight reductions add up to large energy savings. Almost a third of the primary aluminum produced each year goes into automobiles, airplanes, and other transport vehicles.¹⁰ Packaging, such as aluminum cans and foil, accounts for about one fifth of primary metal use, and construction products, such as window frames and roofing, take about an eighth.¹¹ The rest goes into electrical applications (mainly high-tension transmission cables), consumer goods, and machines and equipment.¹²

Most bauxite is mined in the developing

world, but industrial countries use far more of the final product—aluminum—than developing countries. In 1999, the United States, Western Europe, and Japan used nearly two thirds of all primary aluminum.¹³ The United States leads the world here too, in both total and per capita consumption. Taking into account the use of recycled metal, Americans use about 34 kilograms of aluminum per person a year, while the Japanese use 28 kilograms and West Europeans, 21.¹⁴ In contrast, people in developing countries use 1–2 kilograms apiece each year.¹⁵

Aluminum production is one of the world's most energy-intensive industries, and a significant contributor to global climate change. Alumina is smelted to produce pure metal through the application of electric current, a process that requires, on average, more than 15,000 kilowatt-hours per ton of aluminum—enough for an average U.S. household for a year and a half.¹⁶ Primary smelters used an estimated 370 billion kilowatt-hours in 2000, more than 2 percent of world electricity consumption.¹⁷ In 1998, about 54 percent of power for aluminum smelters came from hydropower, 31 percent from coal, 8 percent from natural gas, 6 percent from nuclear power, and 1 percent from oil.¹⁸ Aluminum smelting also releases substantial amounts of perfluorocarbons, gases with very high greenhouse potential.¹⁹

Aluminum smelters now use, on average, about three fourths as much electricity per ton of aluminum as 20 years ago.²⁰ The industry's total electricity use has continued to rise, however, as production has grown.²¹ (See Figure 3.) Only a major expansion of aluminum recycling—and substitution of recycled aluminum for primary metal—is likely to check this rising consumption. Aluminum recycling takes only 5 percent as much energy as primary production.²² Much more metal could be recycled than is currently the case. Americans alone threw away 2.2 million tons of aluminum in 1998.²³ The energy savings from recycling that much metal rather than producing new aluminum from ore could power 2.9 million American households—about as many as in New York City—for a year.²⁴

Link: p. 122

Aluminum Production Keeps Growing

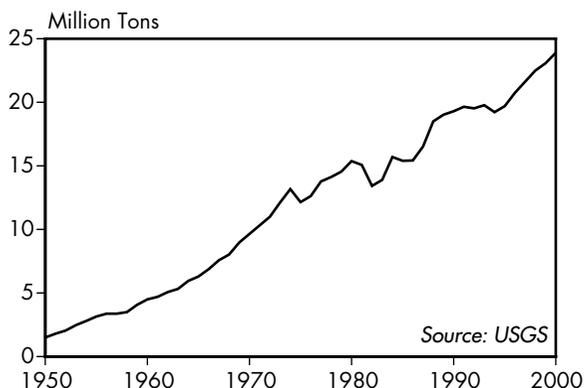


Figure 1: World Primary Aluminum Production, 1950–2000

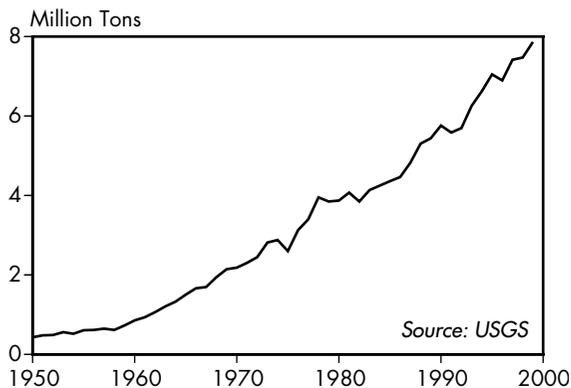


Figure 2: World Secondary Aluminum Production, 1950–99

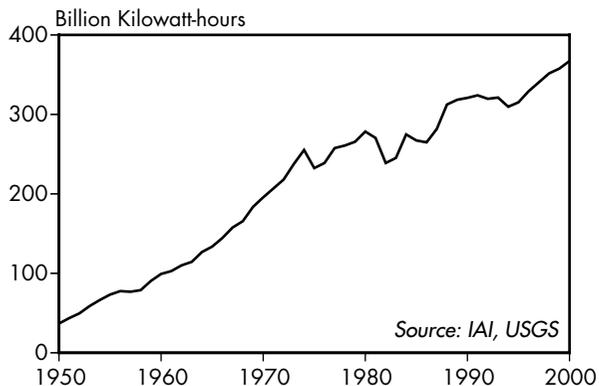


Figure 3: Estimated World Electricity Use in Primary Aluminum Production, 1950–2000

World Aluminum Production, 1950–2000

Year	Primary	Secondary
	(million tons)	
1950	1.5	0.4
1955	3.1	0.6
1960	4.5	0.9
1965	6.3	1.5
1970	9.7	2.2
1971	10.3	2.3
1972	11.0	2.4
1973	12.1	2.8
1974	13.2	2.9
1975	12.1	2.6
1976	12.6	3.1
1977	13.8	3.4
1978	14.1	4.0
1979	14.6	3.8
1980	15.4	3.9
1981	15.1	4.1
1982	13.4	3.8
1983	13.9	4.1
1984	15.7	4.2
1985	15.4	4.4
1986	15.4	4.5
1987	16.5	4.8
1988	18.5	5.3
1989	19.0	5.4
1990	19.3	5.8
1991	19.7	5.6
1992	19.5	5.7
1993	19.8	6.3
1994	19.2	6.6
1995	19.7	7.0
1996	20.7	6.9
1997	21.6	7.4
1998	22.5	7.5
1999	23.1	7.9
2000 (prel)	23.9	n.a.

Sources: USGS, *Mineral Commodity Summaries 2001* (Washington, DC: 2001); Plunkert, USGS, e-mail, 15 November 2000.

Transportation Trends

PHOTOGRAPH BY LAVINIA VELASCO. M/MC PHOTOSHARE, WWW.JHUCCP.ORG/MMC



Vehicle Production Sets New Record
Bicycle Production Recovers

Rising 4 percent in 2000, global passenger car production set a new record of 40.9 million vehicles.¹ (See Figure 1.) Light truck production also reached a new peak, 16.4 million.² The global passenger car fleet grew to 532 million in 2000.³

Japan, the United States, and Germany dominate car output, together producing 47 percent of the global total.⁴ For a long time Canada, France, Italy, and the United Kingdom formed a second tier of manufacturers, but, except for France, they have been overtaken by newer producers in recent years.⁵ Spain and South Korea are now the world's fifth and sixth largest producers.⁶ (See Figure 2.) And Brazil, China, and India are poised for rapid additional growth in the next few years.⁷

Links:
pp. 52, 128

Global passenger car sales ran to 38.8 million in 2000, and 17.4 million light trucks were sold.⁸ Western Europe, Japan, the United States, and Canada account for 75 percent of the world market.⁹ But sales in a number of developing nations—Brazil, South Korea, India, China, and Mexico—have grown rapidly, even as economic crisis has caused considerable volatility for some of them in recent years.¹⁰

Production of cars and light trucks outpaced sales by about 1.1 million units worldwide in 2000.¹¹ Still, auto factories could easily churn out far more. Only 70 percent of the manufacturing capacity was being used last year.¹² At 87 percent, the rate in North America was by far the highest, compared with 76 percent in Western Europe and only 50–60 percent in the rest of the world.¹³

The auto industry is undergoing a wave of consolidation. Since 1985, some \$250 billion worth of acquisitions have been announced, and the merger pace began to pick up real speed in the mid-1990s.¹⁴ Companies partially or wholly acquired since just 1998 form quite a line of famous brands: Chrysler, Daihatsu, Isuzu, Lamborghini, Mazda, Mitsubishi, Nissan, Rover, Saab, Subaru, Suzuki, and Volvo, with South Korea's Daewoo and Samsung also up for sale.¹⁵

The top four car companies now control roughly half the world passenger car market, and the top 10, almost 80 percent.¹⁶ (See Figure 3.) In the top 10 are two U.S. companies (General Motors and Ford), three Japanese (Toyota, Honda, and Nissan), two German (Volkswagen and DaimlerChrysler), two French (Renault and Peugeot), and one Italian (Fiat).¹⁷

Even as the remaining car companies are jousting for more competitive position, environmental concerns about the industry's impact are mounting. Cars and other motor vehicles are an important source of urban air pollution and a major contributor of greenhouse gases. Carbon emissions from U.S. cars and light trucks, at 291 million tons in 1997, exceeded the total emissions of all but a few countries worldwide.¹⁸ Among the members of the European Union, motor vehicle carbon emissions could rise as much as 20–30 percent by 2005.¹⁹

As the number of vehicles on the roads and the distances driven in them continues to grow, so does their impact. The U.S. Department of Energy (DOE) estimates that the global motor vehicle fleet—passenger cars, trucks, and buses—will grow from about 700 million currently to 1.1 billion in 2020.²⁰ In the United States—the most auto-mobile society—annual distances driven in passenger cars more than quadrupled between 1950 and 1999, to more than 2.5 trillion kilometers, and could grow to 3.6 trillion kilometers by 2020.²¹ In the United Kingdom, car travel expanded an astounding 15-fold since 1950.²²

Improvements in fuel efficiency will therefore be critical, but there has been hardly any progress in the last two decades. U.S. fuel economy for new cars has been flat since the mid-1980s.²³ DOE forecasts that average horsepower for new cars in 2020 will be 55 percent higher than in 1999, offsetting much of the expected improvements in fuel economy gained through new efficiency technologies.²⁴ U.S. energy consumption by passenger cars and light trucks is projected to grow by 40 percent between 2000 and 2020.²⁵ These trends are likely to be mirrored in other industrial countries.

Vehicle Production Sets New Record

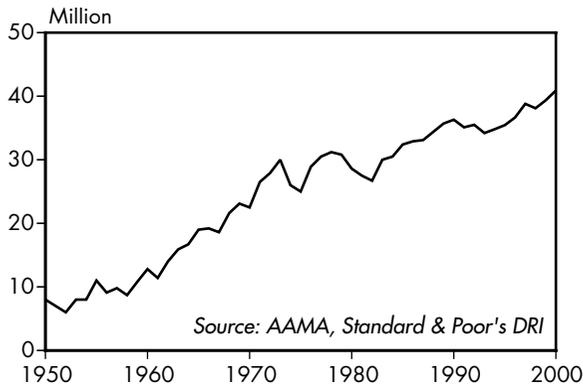


Figure 1: World Automobile Production, 1950–2000

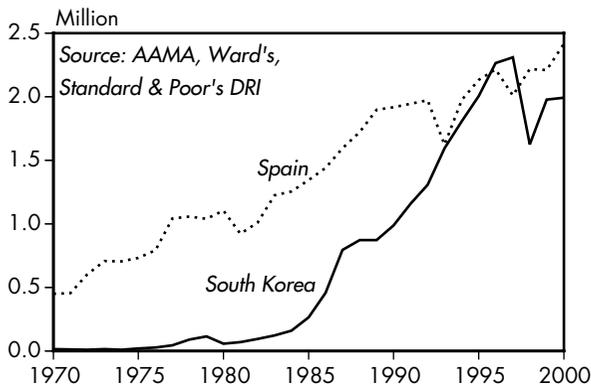


Figure 2: Passenger Car Production in Selected Countries, 1970–2000

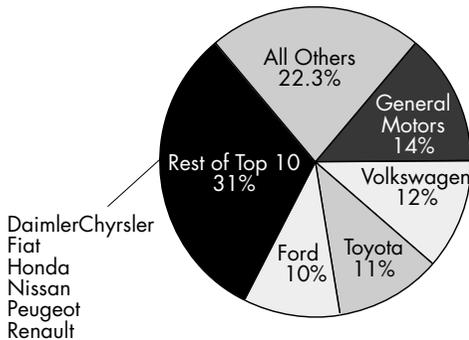


Figure 3: Share of World Passenger Car Production, 1999–2000

World Automobile Production, 1950–2000

Year	Production (million)
1950	8.0
1955	11.0
1960	12.8
1965	19.0
1970	22.5
1971	26.5
1972	27.9
1973	30.0
1974	26.0
1975	25.0
1976	28.9
1977	30.5
1978	31.2
1979	30.8
1980	28.6
1981	27.5
1982	26.7
1983	30.0
1984	30.5
1985	32.4
1986	32.9
1987	33.1
1988	34.4
1989	35.7
1990	36.3
1991	35.1
1992	35.5
1993	34.2
1994	34.8
1995	35.5
1996	36.7
1997	38.8
1998	38.1
1999	39.4
2000 (prel)	40.9

Sources: American Automobile Manufacturers Association; Standard & Poor's DRI.

Bicycle production recovered to 95 million units in 1999, the latest year for which global production data are available.¹ (See Figure 1.) This represents a 22-percent increase over 1998, and reverses three years of global decline in output, when excess inventories cut demand at the factory.² The recovery was driven by increased purchasing in China, the European Union, and the United States—three of the leading markets.³

Asia continues to be the dominant bicycle-producing region. China bounced back from a poor year in 1998 to manufacture 43 million bicycles in 1999.⁴ Output from Taiwan slipped somewhat, from fewer than 11 million units to just over 8 million.⁵ But India held steady, with 11 million units.⁶ The three Asian giants accounted for nearly two thirds of global production.⁷ They were also the world's leading exporters, sending more than half of their combined output overseas, and claiming some 86 percent of global bicycle exports in 1999.⁸

Outside of Asia, the European Union remained the second largest producer, at 12 million units, roughly on a par with previous years.⁹ But the United States continued a steep slide in production, with only 1.7 million new bicycles in 1999, compared with 6 million just two years earlier.¹⁰

Production declines in Taiwan, the United States, and Japan partly reflect manufacturers' flight in search of low-wage labor.¹¹ U.S. producers shifted operations first to Mexico, and then more recently to China.¹² Many Japanese manufacturers have also moved operations to China, while Taiwanese companies have set up shop in Viet Nam.¹³

Electric bikes continue to be a rapidly growing niche product. Total global sales reached 1.1 million units in 2000, triple the level of 1999.¹⁴ (See Figure 2.) Some 750,000 of these were sold in China, where electric bicycles are now a clean and comfortable commuting option.¹⁵ In the industrial world, electric bicycles are often marketed through automobile companies, such as Ford, which has created Think Mobility to produce electric vehicles, including bicycles.¹⁶

Changes in production centers and products

are matched by changes in the demographics of cycling. In industrial countries, an aging population has boosted demand for "comfort" bikes with padded seats and large tires, folding bicycles that can be stowed in a car trunk, and electric bicycles.¹⁷ In contrast, American children may be losing interest: between 1990 and 1999, the number of people aged 7–17 who rode more than once a year declined by more than 13 percent, even as the population under 15 years of age expanded by some 7 percent.¹⁸

Government continues to be an important influence on bikes' popularity. Municipal authorities in Paris, Rome, Milan, and Bogota all sponsored "car-free days" in 2000 to highlight the availability and benefits of non-automotive transportation, including bicycles.¹⁹ In the car-centric United States, concerns about traffic congestion and sprawl along with increased federal funding for cycling have led to a few initiatives to promote cycling. A 4,200-kilometer cycling trail is near completion on the East Coast, and California's Marin County has proposed a bicycle master plan with 200 different projects inspired by the highly successful plan in the Dutch city of Delft.²⁰

On the other hand, where authorities pay insufficient attention to the potential and needs of bicycles, cycling can become dangerous or marginalized. In China, traffic fatalities have doubled in the past 15 years—with 35 percent of the deaths being cyclists—because official deference to automobiles has left bikes at a disadvantage on increasingly crowded roads.²¹ And in the United States, state governments have been slow to claim funds authorized by the federal government to improve cycling and walking, jeopardizing a renewal of such funding when the next transportation bill comes before Congress.²²

The market for bicycles is also being expanded by nonprofits like Pedals for Progress, which rehabilitates old U.S. bicycles and exports them to developing countries, where they are sold cheaply as a spur to economic development.²³ The group aims to put 20 percent of the developing world's walking labor force on bicycles.²⁴

Bicycle Production Recovers

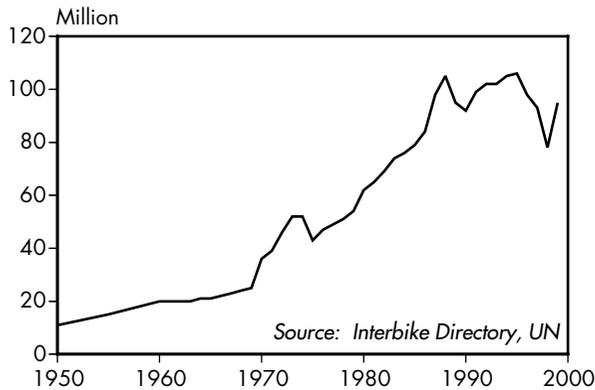


Figure 1: World Bicycle Production, 1950-99

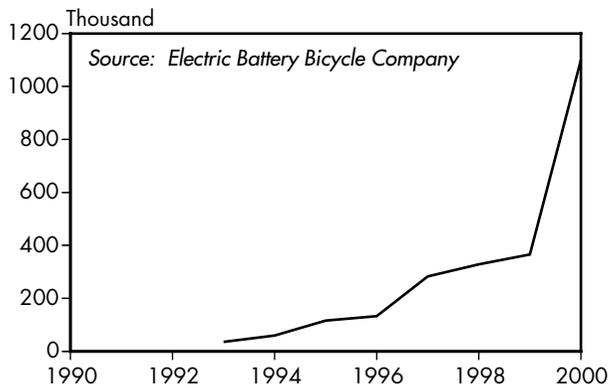


Figure 2: World Electric Bicycle Sales, 1993-2000

World Bicycle Production, 1950-99

Year	Production (million)
1950	11
1955	15
1960	20
1965	21
1970	36
1971	39
1972	46
1973	52
1974	52
1975	43
1976	47
1977	49
1978	51
1979	54
1980	62
1981	65
1982	69
1983	74
1984	76
1985	79
1986	84
1987	98
1988	105
1989	95
1990	92
1991	99
1992	102
1993	102
1994	105
1995	106
1996	98
1997	93
1998	78
1999 (prel)	95

Sources: United Nations, *The Growth of World Industry 1969 Edition*, *Yearbook of Industrial Statistics 1979* and *1989 Editions*, and *Industrial Commodity Statistics Yearbook 1998*; *Interbike Directory*, various years.

Economy and Finance Features

PHOTOGRAPH BY ALAN SCHEIN/CORBIS STOCKMARKET



Pharmaceutical Sales Thriving
PVC Plastic Pervades Economy
Microcredit Expanding Rapidly
Stock Markets Follow a Rocky Road
Socially Responsible Investing Surges
Toll of Natural Disasters Grows

Worldwide sales of pharmaceuticals have jumped more than 2.5-fold since 1983, from \$132 billion to \$337 billion.¹ (See Figure 1.) Sales were up 9 percent from 1998 to 1999, and annual growth has averaged 7 percent for the past two decades, in what is one of the most profitable and fastest-growing industries in the world.²

Pharmaceutical sales are largely concentrated in the industrial world, highlighting broader disparities in income levels, health care options, disease burdens, and life spans. North America, Western Europe, and Japan, with 14 percent of the world's population, account for

Links: pp. 78, 132, 134, 138

83 percent of pharmaceutical sales.³ The United States alone, with just 5 percent of humanity, buys nearly 40 percent of the world's legal drugs.⁴

In stark contrast, Asia (excluding Japan) uses 8 percent, Latin America and the Caribbean 7 percent, and Africa just 2 percent.⁵

The great profitability of the legal drug industry has several explanations, including the monopolistic pricing that comes with drug patents and people's willingness to pay for medicines that reduce disability and suffering.⁶ Drug companies claim that huge profit margins are justified by the industry's large research and development outlays and the high cost of bringing a new drug to market, although the companies spend roughly twice as much on marketing as on R&D.⁷

Not surprisingly, the top-selling drug classes are designed to treat First World illnesses, including heart disease, high blood pressure, and indigestion. At the head of the list, with \$15.8 billion in annual sales, is antiulcerants (drugs for indigestion or antacid), which includes top-selling Prilosec.⁸ Cholesterol reducers and calcium antagonists (anti-hypertensives)—including Zocor, Lipitor, and other drugs for cardiovascular disease—are the second and fourth top sellers.⁹ Antidepressants, including Prozac and Zoloft, are the third leading drug class, while antirheumatic non-steroidals (pain medicine) round out the top five.¹⁰

Despite big disparities in drug use per per-

son, as diets, lifestyles, and incomes change around the world the top drug categories are becoming similar. Antiulcerants are a top-5 category on all continents, while Norvasc, an anti-hypertension drug, is a top-10 seller everywhere.¹¹ Most legal drug use in the developing world is by wealthier segments of the population, who are likely to have the same diseases as First World patients.

Still, differences do exist: while antibiotics do not make the top 10 in the industrial world, they rank in the top 3 in the developing world.¹² And generic versions of top-selling drugs often predominate in these countries.¹³ Another difference is the scale of use: at \$1 billion or more, sales of blockbuster drugs like Viagra, for male impotence, exceed the entire health budgets—let alone the medicine budgets—of most developing nations.¹⁴

Across regions, rising drug costs are beginning to weigh on health care systems, transforming the profits of the drug industry into a sensitive political issue. For instance, the introduction of western medicines—and western health problems—has greatly contributed to the 35-percent annual growth in China's medical costs.¹⁵ And in the United States, spending on prescription drugs has more than doubled in the last decade, becoming the fastest-growing item in the nation's health care budget.¹⁶

A rash of mergers in recent years has made the legal drug business among the world's most concentrated. The top 10 pharmaceutical firms control upwards of 35 percent of the global market.¹⁷ The top 5 firms—Merck, Pfizer, and Bristol-Myers Squibb, based in the United States, and the British firms AstraZeneca and Glaxo Wellcome—all enjoy annual sales of more than \$10 billion.¹⁸

The greater availability and array of pharmaceuticals has played a central role in increasing life expectancy and reducing disease and disability around the world. But the biggest health payoff has probably come from some of the least expensive innovations. For example, the \$2.7-billion global vaccine market represents less than 1 percent of global drug sales, although the World Health Organization

(WHO) estimates that every \$1 spent on childhood vaccines saves \$7–20 on treatment of the targeted illnesses—not to mention great reductions in human suffering and child mortality.¹⁹

Still, the research focus of big pharmaceutical companies has tended to neglect the health needs of large chunks of the planet, including research on a malaria vaccine. Of 1,233 new drugs that reached market between 1975 and 1997, only 13 products were approved specifically for tropical diseases, including some of the world's biggest killers.²⁰ At the same time, legal issues have sometimes proved a barrier to drug access, as with the patent protection that prevents local production of antiretrovirals for HIV/AIDS in hard-hit developing nations.²¹

Even where drugs are available and off-patent, cost remains the biggest barrier to access. WHO estimates that one third of humanity lacks regular access to essential drugs that together provide treatment for the majority of infectious and chronic disease affecting the world's population.²² The share without access to this drug package has remained unchanged since the mid-1980s, and grows to 50 percent in the poorest nations, despite an estimated cost of just \$2 per person.²³ In 1998, one in four children did not receive routine immunization with the six basic vaccines against polio, diphtheria, whooping cough, tetanus, measles, and tuberculosis.²⁴

Innovative public-private partnerships have great potential to help close this “global drug gap.”²⁵ In recent decades, pharmaceutical companies have been encouraged to donate medicine or participate in public-private partnerships in the development and distribution of medicine. One of the more successful is the Mectizan Donation Program, a partnership between WHO and Merck, which developed and donated ivermectin for treatment of river blindness, providing enough product to treat 30 million people in 20 countries in 1999.²⁶ In some cases, suspending patent rules may hold even greater promise.²⁷

Drug marketing is directed primarily at doctors—a practice that can encourage overreliance on medications or inappropriate use.²⁸ Of the \$13.9 billion that U.S. drug companies spent promoting their products in 1999, about \$12 billion was aimed at doctors, nurse practitioners, and other medical employees who can prescribe medications.²⁹ At the same time, a surge in direct advertising to consumers has raised the risk of inappropriate use, as well as

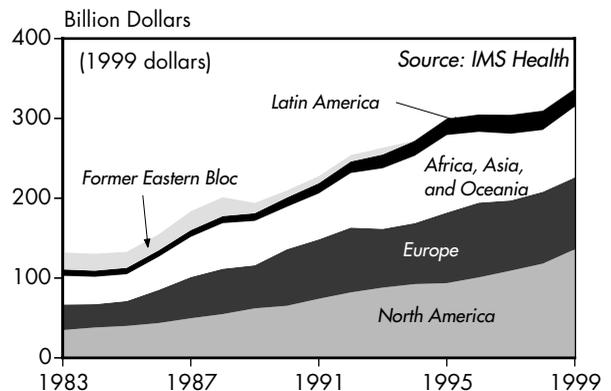


Figure 1: Regional Pharmaceutical Sales, 1983–99

stimulating a surge in consumer demand for newer, costlier drugs when less expensive products might work just as well.³⁰

Overmedication has emerged as a serious problem in wealthier settings, particularly among elderly individuals, for whom multiple pharmaceutical regimens are more the rule than the exception.³¹ A 1998 report estimates that adverse reactions to prescription drugs kill 106,000 Americans each year—more than automobile accidents—and injure more than 2.2 million.³² With more people taking several drugs at any given time—three out of four doctor's visits in the United States end with a prescription—the risk of unwanted synergies between drugs increases.³³ And over the long term, pharmaceuticals may be distracting attention from other measures, such as changes in diet and exercise, that could prove more effective, safer, and more economical.

Polyvinyl chloride (PVC) plastic is now one of the most commonly used synthetic materials in the world. Some 250 million tons of PVC are in use today; another 100 million tons are piling up in landfills, feeding incinerators and backyard fires, or clogging the recycling stream.¹ In terms of production volume, PVC is the second most common plastic in the world after polyethylene, but it is put to more uses.² Some 60 percent of PVC is used in building materials, with the remainder found in packaging, electrical wiring, and countless other consumer goods.³

About 25 million tons are now produced annually, a sum that is expected to grow considerably in the next decade.⁴ Global production increased 39 percent in just seven years—from 18 million tons in 1992 to 25 million tons in 1999, despite a significant downturn during the recent Asian economic crisis.⁵ Fueling this trend is the surge in demand: in the early to mid-1990s, world consumption was growing 3.6 percent a year; in the first half of this decade, the annual rate will be nearly 5 percent.⁶ By 2005, the market for PVC is projected to reach some 33 million tons.⁷

Between 1989 and 1999, U.S. PVC production grew 66 percent, from 3.8 million tons to 6.3 million tons.⁸ The United States is currently the world's largest producer, but in terms of regional production, Asia dominates. (See Table 1.) In 1999, 34 percent of the world's PVC production capacity was in Asia, with 9 percent in Japan alone.⁹ (Factories have run at about 80 percent capacity in recent years.)¹⁰ About 150 companies in 50 different countries currently produce the material, but the largest manufacturers are in Asia.¹¹ Japan's Shin-Etsu Chemical Company is the world's largest producer, and Formosa Plastics of Taiwan is number two.¹²

Between 1998 and 1999, Japan's PVC production stabilized at 2.46 million tons, but its production of ethylene dichloride—a key ingredient in PVC—hit 3.5 million tons in 1999, the highest level ever.¹³ PVC production in Taiwan jumped 21 percent between 1998 and 1999, while South Korean production rose 15 percent.¹⁴

The primary driver of Asian demand will likely be the construction industries serving major urban areas—megacities like Beijing, Bangkok, and Manila—and outlying parts in developing countries. China's demand for PVC is expected to jump from 2.5 million tons in 1998 to 6.5 million tons by 2010, a boost of 160 percent.¹⁵

As production climbs, the politics concerning this material continue to heat up as well, in large part because the manufacture and disposal of PVC creates dangerous toxic chemicals and because its use can release harmful chemical additives into the environment.

The production of PVC generates many toxic and persistent byproducts, including dioxins and furans, compounds known as persistent organic pollutants (POPs).¹⁶ Under a recent U.N. treaty on POPs, countries will be obligated to reduce—and eliminate, where feasible—the creation of dioxins and furans in manufacturing practices, including PVC production.¹⁷

At the end of its life, PVC again poses a health risk. Today most PVC waste is either incinerated or landfilled; only a small fraction is recycled.¹⁸ Burning chlorinated compounds generates dioxins. Because nearly 45 percent of PVC by weight is chlorine, incineration is a virtual guarantee of significant dioxin emissions.¹⁹ Most PVC waste in the world is buried in dumps, where the dangers include accidental fires and the leaching of chemical additives into water, soil, fish, and plants.²⁰ These issues become more pressing as the mountain of discarded PVC continues to grow worldwide. In the European Union alone, PVC waste is expected to jump 76 percent over the next two decades.²¹

In terms of suspected direct human health effects, the greatest concerns are the additives in PVC, which give the material a range of characteristics from flexibility to flame retardation and color. In 1999, global sales of plastics additives hit \$15.5 billion.²² The most important additives are plasticizers, which confer flexibility. Some 90 percent of plasticizers belong to a group of 25 compounds called

phthalates, and some of the most common phthalates are POPs or POP-like compounds.²³

Because phthalates are not chemically bonded to the resin, they can migrate to the surface of the material and leak into the surrounding environment.²⁴ For example, hospital patients receiving infusions have been shown to be at risk of exposure to a commonly used phthalate known as DEHP, which can leach directly out of intravenous tubes and into a patient's bloodstream.²⁵

In both wildlife and laboratory animals, phthalates have been linked to a range of reproductive health effects, including reduced fertility, miscarriage, birth defects, abnormal sperm counts, and testicular damage, as well as liver and kidney cancer.²⁶ Recently, scientists at the U.S. Centers for Disease Control and Prevention detected phthalates in the urine from women of childbearing age at levels that cause fetal abnormalities in laboratory animals.²⁷ A 1999 study in Oslo, Norway, concluded that young children may absorb phthalates from vinyl floor covering; children in homes with such coverings had an 89-percent greater chance than other children of develop-

ing bronchial obstruction and symptoms of asthma.²⁸

Faced with such risks, a growing number of policymakers and consumers are questioning the use of PVC. In July 2000 the European Parliament voted to permanently ban all phthalate-softeners from PVC toys and other items that children are likely to chew on.²⁹ Eight European nations have unilaterally banned the additives in PVC toys for toddlers.³⁰ In a global first, Denmark recently imposed a tax on all PVC products and phthalates to discourage demand.³¹ A number of companies—from automobile manufacturers to medical equipment providers—are now phasing out PVC in response to the public attention concerning health and environmental impacts.³² The electronics giant Sony International recently announced that it would stop using PVC in all its products beginning in 2002.³³

Alternatives currently exist for almost every application of PVC; the challenge is to adopt them widely. Substitute materials in the construction sector vary from traditional materials such as wooden window frames to high-tech modifications of familiar materials, such as a new generation of polyolefins (nonchlorinated plastics) that are being developed.³⁴ Another promising trend is the development of plastics from a wide variety of plant materials—oat hulls, corn, soybeans, oil seeds, or wood, for example.³⁵ At present, unfortunately, the possibilities for substituting such biopolymers for PVC are fairly limited.³⁶ But as with other environmental technologies, there is reason to hope that demand will help drive innovation. Until then, safer materials can be used in construction projects and consumer goods to reduce the health risks of PVC use.

Table 1: PVC Production Capacity by Region, 1999, with Projections for 2002

Region	1999		2002	
	Total (thousand tons)	Share (percent)	Total (thousand tons)	Share (percent)
North America	7,908	28	9,350	27
Western Europe	6,100	21	6,320	18
Japan	2,581	9	2,772	8
Other Asia ¹	7,235	25	10,150	30
Other Regions ²	4,912	17	5,595	16
World Total	28,736		34,187	

¹China, Hong Kong, India, Indonesia, Malaysia, Philippines, Singapore, South Korea, Taiwan, and Thailand. ²Africa, Eastern Europe, Latin America, Middle East, and Oceania.

Sources: 1999 from CMAI, "Polyvinyl Chloride," *PVC Insight*, vol. 8, issue 15 (2000), p. 1; 2002 estimates from Joel A. Tickner, *Trends in World PVC Industry Expansion* (Washington, DC: Greenpeace, 19 June 1998), p. 2.

Microcredit, the provision of small-scale financial services to the poor, is expanding rapidly throughout the developing world, as well as in some industrial countries. Global data are scarce, but one survey by the group Microcredit Summit found that the number of poor assisted worldwide through such programs rose by 12 percent between 1998 and 1999, to 23.6 million.¹ (See Table 1.) Of these, more than half were classified as the poorest of the poor—the bottom 50 percent of individuals living below their nation's poverty line—and a disproportionate share were women.²

Asia is far and away the leading region for microfinance activity, accounting for 78 percent of the world's clients and 9 of the 10 largest microfinance institutions in the global survey.³ Africa, with 16 percent of clients, was a distant second, but activity is expanding there faster than in any other region.⁴ Industrial countries account for less than 1 percent of all clients.⁵

Microfinance institutions (MFIs) could potentially provide financial services to many of the nearly 3 billion people who live on \$2 or less per day, whose financial needs are too small to be handled by traditional financial institutions.⁶ MFIs can manage loans of as little as \$50, for example, and savings deposits as small as \$5.⁷ The interest rates they charge are often higher than those of commercial institutions, because of the expense associated with administering small, short-term loans. Yet low-income people accustomed to the exorbitant rates of private moneylenders often find MFI rates to be a bargain. As someone at a non-governmental organization (NGO) in Bolivia noted, "It's a paradox.... To reach the poorest we have to charge the highest" of any institutional lender in the country.⁸

MFI loans help independent entrepreneurs, many of whom work out of the home, to generate greater income; they might allow a basketweaver, for instance, to purchase supplies in bulk to lower costs. And because MFIs target women, who account for up to 70 percent of the world's poor and who tend to use a higher share of earnings for family needs than men do, supporters hope that MFIs could become a

major new weapon in combating poverty.⁹

Asia's predominance in microfinance is due in part to its long experience in this field. Asia is home to the first institutionalized MFI, the Grameen Bank, founded in Bangladesh by economist Muhamad Yunus in the 1970s. Yunus created a system of small-scale lending that requires no collateral for participation. Villagers are organized into units of five, two of whom are initially eligible for a loan.¹⁰ New loans are made only when the first loans are paid off. Thus the "social capital" of neighborhood ties and the peer pressure produced by these relationships serve as the "moral collateral" that ensures a high rate of repayment—95 percent in Grameen's case.¹¹

Grameen is now the largest rural finance institution in Bangladesh, with more than 1,100 branches serving nearly 40,000 villages—double the number in 1990.¹² It has more than 2.3 million borrowers, nearly triple the number in 1990, 94 percent of whom are women.¹³ By the mid-1990s, Grameen lending had financed more than a half-million homes in Bangladesh, and was generating economic activity valued at more than 1 percent of Bangladesh's gross domestic product.¹⁴ Because of its success, the Grameen model has been replicated in 58 countries during the last decade.¹⁵

As microcredit programs have matured, many have expanded their services. Some programs, such as the Village Banking model created by the NGO FINCA, combine savings and credit services. Borrowers are required to save 20 percent of the loan amount they are granted, and are then eligible for a second loan equal to the original loan plus the accumulated savings.¹⁶ In this way, clients gain access to larger and larger loans as they expand their own capital base. The women of the FINCA Uganda program, for example, have accumulated savings equivalent to 97 percent of their loan portfolio in just five years.¹⁷ Some MFIs now offer leasing as well, giving the poor access to equipment—from sewing machines to solar power systems—that can help generate greater income.¹⁸ And some offer insurance,

Table 1: Growth and Composition of Microfinance Institution Clients, 1999

Region	Number of Clients (thousand)	Increase over 1998 (percent)	Poorest as Share of Clients ¹
Africa	3,834	29	68
Asia	18,427	10	57
Latin America and the Caribbean	1,110	12	48
Middle East	47	6	61
North America	47	16	61
Europe and Countries in Transition	44	8	42
World	23,556	12	58

¹The bottom 50 percent of a country's population living below the poverty line.

Source: Microcredit Summit, "Empowering Women with Microcredit: 2000 Microcredit Summit Campaign Report," <www.microcreditsummit.org/campaigns/report00.html>, viewed 26 February 2001.

especially to cover the debts of clients in case of their death or disability.¹⁹

MFIs appear to better the lives of participants, especially by providing stability to people subject to economic volatility, such as seasonal unemployment or spikes in the price of production inputs.²⁰ Whether it also raises incomes is unclear. It is most likely to do so when access to credit is combined with assured access to complementary inputs such as seeds and irrigation water, and when other important conditions such as market access are in place.²¹

Microcredit is especially effective when combined with efforts to educate. The Credit with Education program in Ghana uses credit group meetings to teach participants about diarrhea prevention, breast-feeding, immunization, family planning, and HIV/AIDS prevention—with striking results.²² Ninety percent of participating women reported increases in their income, the share of families reporting periods of food deprivation in the previous 12 months fell by half, and the measures of nutritional levels of one-year-olds improved significantly.²³

Because providing financial services to the poor is expensive, many believe that MFIs cannot cover their costs without ongoing subsidies. But the record to date suggests that financial self-sustainability and service to the poor are not mutually exclusive. Since 1997, approximately 50 percent of microfinance institutions reporting to the *MicroBanking Bulletin*, a publication that monitors this emerging industry, were financially self-sufficient.²⁴ This average covered a wide range of performance, however: in the Middle East and North Africa, 17 percent were self-sustaining; in Africa, 32 percent; in Eastern Europe, 36 percent; in Asia, 55 percent; and in Latin America, 77 percent.²⁵ And the *Bulletin* reported in 2000 that 3 of the 10 most sustainable institutions served the poorest of the poor exclusively.

MFIs are not a panacea for the world's poor. They are unlikely, for example, to help the extremely poor—the homeless and destitute—because microcredit works best for those whose lives are stable and who have a steady, if meager, income.²⁶ Social safety nets will still be needed, even if microfinance spreads widely.²⁷ But if the Microcredit Summit Campaign reaches its goal of helping 100 million of the world's poorest families by 2005—a figure that represents probably 40 percent of the world's 1.2 billion people living in absolute poverty—it could provide an encouraging lift to many of the world's poor.²⁸

Since 1697, when the world's first stock exchange was set up in London, stock markets have been one of the key ways to raise capital, in addition to banks and bond markets.¹ During the 1980s and even more so the 1990s, stock markets worldwide rose dramatically in prominence: the number of exchanges in operation expanded, the total volume of stocks traded surged, and stock prices skyrocketed.² In 2000, however, declining stock values interrupted this explosive growth.³

While the 1990s' "bull market" has been interpreted by many as testament to the genius of free-market capitalism, the ascendance of

Link: p. 114 stock markets is not necessarily a good indicator of how sound a national economy is or how well people's needs are being met. Stock markets tend to overshoot in their upward and downward movements, potentially wreaking havoc in the economy and distorting social and economic development. Wall Street and other financial centers may punish otherwise healthy companies if their returns do not live up to short-term profit expectations.⁴ Stock markets may allocate capital unwisely, such as overinvesting in poorly conceived Internet start-ups that subsequently go bankrupt, while making it harder for some traditional businesses to raise capital; this appears to have happened in 1998 and 1999.⁵ Exaggerated stock values may also give the public a false sense of security that their private pension plans are adequately funded.⁶

Stock market values around the world, with the notable exception of Japan, were on a wild upswing until March 2000.⁷ Morgan Stanley Capital International's MSCI World index, a composite of stocks from several industrial and developing countries, grew about 5-fold in value between 1980 and 1999; MSCI's Europe index rose 4.4-fold, a composite Latin America index developed by Global Financial Data rose 4-fold, and an Emerging Asia index increased 2.5-fold.⁸ But the developing-country indices were marked by much greater volatility. The Standard & Poor's (S&P) 500 index, one of the most widely used benchmarks to assess stock market performance in the United States, grew

6-fold in value between 1980 and the end of 1999.⁹ (See Figure 1).

Global stock market "capitalization"—the value of the stocks of all the roughly 50,000 companies listed on the world's stock exchanges—catapulted from \$11.4 trillion in 1990 to \$34.9 trillion in 1999, expanding 10 times faster than the world economy.¹⁰ The United States alone accounts for half the global total, followed by Japan (13 percent) and the United Kingdom (8 percent).¹¹ The value of developing countries' stock markets has more than quadrupled, from \$587 billion in 1990 to \$2.7 trillion in 1999.¹²

Soaring stock values have made some people fantastically rich—on paper, at least—and have contributed to a considerable widening of wealth disparities. Worldwide, there are now 7 million people with a net worth of more than \$1 million.¹³ The ranks of individuals holding financial assets of at least \$30 million have expanded from 36,500 in 1996 to 55,400 in 1999.¹⁴ And the number of billionaires grew from 232 in 1990 to 514 in 1999.¹⁵

The number of people owning stock is rising—particularly in the United States and the United Kingdom, where shares are increasingly popular as a form of employee compensation and where employer-funded pension plans are being invested in stocks (either directly or indirectly, through mutual funds).¹⁶ Still, stock ownership remains highly concentrated. The richest 1 percent of U.S. households captured 42 percent of the stock market gains between 1989 and 1997, and the top 10 percent secured 86 percent.¹⁷

The inequality effect of the stock market boom is more pronounced in the United States than in most other industrial countries, because while stock prices surged there, wages stagnated. In 1999 it took the average U.S. worker almost 92 hours to earn enough money to purchase a representative share of the S&P 500 stock index—up from about 20 hours in 1980.¹⁸ As a result, the gap between haves and have-nots in the mid- to late 1990s was greater than at any time since 1929. The top 1 percent of American wealth holders controlled 38 per-

Stock Markets Follow a Rocky Road

cent of total household wealth, and the top 10 percent had 71 percent.¹⁹

Stock prices reflect investors' expectations of future corporate profits—though short- and long-term expectations may at times diverge substantially. Low inflation, lower taxes, the rise of information technologies, and deregulation helped bring about strongly rising profits in the 1990s. Still, stock prices outpaced even these record earnings.²⁰ As many have noted, the last few years have also been characterized by investors' "irrational exuberance"—the expectation that the good times will simply keep on rolling.²¹ But the feedback loops that generate such expectations can also turn negative and amplify a downturn far beyond a reasonable range.

It is worth recalling the roller-coaster experience of the Japanese stock market. The Nikkei 225 index more than tripled in value between 1982 and 1989.²² But an ailing economy and the burst of a massive real-estate bubble led to a collapse of the Nikkei. It has lost more than two thirds of its value since then. (See Figure 2.)

Judging by past experience, most stock markets were considerably overvalued by late 1999. The P-E ratio, the price of a share of stock relative to the earnings per share, has historically averaged about 15:1 for the S&P 500 in the United States.²³ By early 1997, P-E ratios were at double this average and rose past 40:1 by 1999, but then declined during 2000.²⁴ No one can forecast future stock prices. But in the past, whenever the P-E ratio climbed far beyond the normal range suggested by the historical average, it was followed by a pronounced market downturn—or even a disastrous crash, such as the one in 1929 that triggered the Great Depression.

Although a stock market crash would most directly hurt those own-

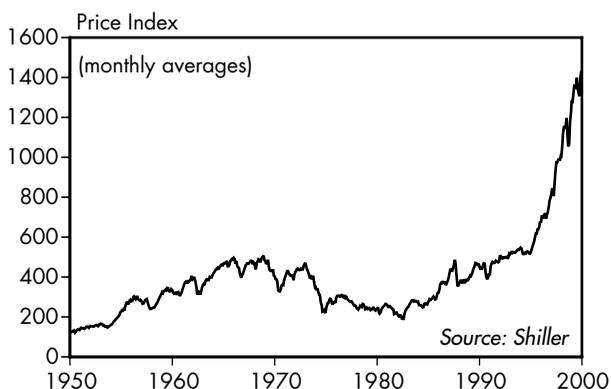


Figure 1: Standard & Poor's 500, 1950–2000

ing large quantities of stocks, others would suffer as well. Those who have invested their retirement funds in stocks would face unexpected shortfalls. And there are broader consequences. Particularly in the United States, the economy has been propelled by a stock market-driven consumption boom.²⁵ A crash would likely cause most people to cut back substantially on their spending; the resulting falloff in demand could then trigger a recession and a rise in unemployment.²⁶ Because trade, exchange rates, and capital flows increasingly bind together the world's economies, a downturn in the United States could also have ripple effects in other countries, even if their own stock markets managed a softer landing.²⁷

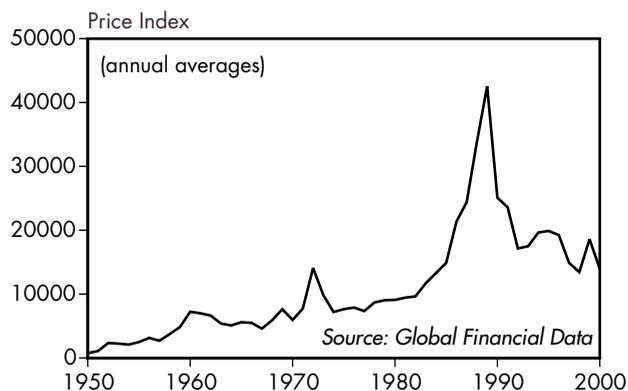


Figure 2: Nikkei 225, 1950–2000

Recent years have seen a rapid growth in “socially responsible investing” in many industrial countries. This can take several forms, from channeling money into investment funds that screen companies and industries according to social or environmental criteria, to engaging in “shareholder activism” to influence the policies of companies an investor owns shares in, to “community investment” in local development initiatives, such as affordable housing projects and small business lending.

Although no global tally exists of total assets invested according to social criteria, a range of country-based studies demonstrate steady

Link: p. 112

growth. The largest and most thoroughly tracked market is the United States. According to data compiled by the Washington-based Social Investment Forum, money in funds based in the United States that is invested according to social criteria climbed from \$59 billion in 1984 to \$682 billion in 1995 and then to \$2.16 trillion in 1999—\$1 out of every \$8 under professional management in the United States.¹ (See Figure 1.)

The 1999 U.S. total includes \$1.2 trillion of investments in screened portfolios, \$657 billion of investments controlled by investors active in shareholder advocacy, \$265 billion in investments where both strategies were pursued, and \$5 billion in community investment.² Between 1997 and 1999 alone, the total assets invested according to social criteria increased by 77 percent—nearly twice the overall growth rate of funds being professionally managed over that period.³

In the first national survey conducted in Canada, the Toronto-based Social Investment Organization recently reported that nearly \$50 billion was now being invested according to social criteria, including some \$10 billion in retail funds available to relatively small investors, \$11 billion in funds that are privately managed by investment companies for institutional investors and other clients, \$27 billion invested in-house by institutional investors, \$1 billion in investments involving shareholder advocacy initiatives on social and environmen-

tal issues, and \$85 million in locally based community investment organizations.⁴ Between 1998 and 2000, the Canadian retail market grew by more than 75 percent—more than twice the mutual fund industry’s overall rate of growth.⁵

In Europe, there are now more than 220 retail-based social investment funds, up from only 26 in the mid-1980s, according to estimates by Avanzi, an Italian-based research and consulting firm.⁶ As of late 1999, more than 11 billion Euros (\$10 billion) was invested in these funds.⁷ The United Kingdom leads the way in socially responsible investing in Europe, with 44 green and ethical retail funds in place as of mid-2000, which between them had more than £3 billion (\$4.3 billion) in assets under management by early 2000.⁸ These numbers vastly understate the total amount of money being invested according to social and ethical criteria in Europe, as they do not include private and institutional investment portfolios.⁹

Socially responsible investment funds apply a variety of screens targeted to the diverse interests and concerns of their investors, including issues of labor relations, environmental protection, and human rights. The screens used by different funds vary widely in both their breath and stringency.¹⁰ They can also have both positive and negative components, meaning they seek out companies with positive records on targeted issues while excluding those that produce harmful products or engage in socially unsound business practices. Tobacco is the most common screen applied by U.S.-based funds—96 percent of them ban this industry from their portfolios.¹¹ Most U.S. funds also avoid investing in the gambling, liquor, and weapons industries.¹² And nearly 80 percent address environmental issues in some manner, whether by screening out companies with poor records or screening in companies and industries deemed particularly “green.”¹³

In one variation on socially responsible investing, some financiers are promoting “sustainability investing,” which encourages a positive approach to investing by targeting

Socially Responsible Investing Surges

companies that are deemed leaders rather than laggards on environmental and social issues.¹⁴ In September 1999, for example, Dow Jones Indexes and the Switzerland-based SAM Sustainability Group launched the Dow Jones Sustainability Group Index, which tracks the financial performance of more than 200 “sustainability-driven” companies representing 64 industries in 33 countries.¹⁵ The index is dominated by European companies in such sectors as automobiles, paper products, food, banks, insurance, and waste management.¹⁶ As of February 2001, financial institutions in 11 countries, including Australia, Germany, Japan, the Netherlands, and Switzerland, have now created investment funds based on the Sustainability Group Index.¹⁷

Shareholder activism, the other major type of socially responsible investing, involves exerting leverage on environmental and social issues as a partial owner of a company, either through dialogue with management or by filing or supporting shareholder resolutions at annual meetings. In 1999, concerned investors in the United States introduced more than 200 shareholder resolutions on a broad range of issues, including environmental concerns, corporate governance, and international health and tobacco matters.¹⁸ In one particularly successful case, Home Depot, a large lumber and hard-

ware store, announced it would stop selling forest products from environmentally sensitive areas and would give preference to timber certified as sustainably produced just three months after 12 percent of its shareholders asked the company to stop selling wood from old-growth forests.¹⁹ In 2000, climate change and genetically modified organisms were popular issues for shareholder activism.²⁰

One important spur to the recent growth of socially responsible investment has been growing evidence that investment funds screened according to social and environmental criteria have financial returns that are competitive with if not superior to those of conventional portfolios. The Domini 400 Social Index (DSI 400), which monitors the financial performance of 400 U.S. corporations that pass a range of common social screens, posted average annual returns of more than 17 percent over the last decade, outperforming the Standard and Poor’s 500.²¹

The growing evidence that socially responsible investing need not entail financial sacrifice has attracted powerful new entrants to the field. A number of large firms, including Ford Motor Company, Hewlett-Packard, and the Gap, are now offering their workers a socially responsible option in their retirement plans, and several well-established, mainstream investment companies, including TIAA-CREF and the Vanguard Group, have added socially screened funds to their standard menu of offerings.²²

As the combined financial might of social investors grows, so will their clout within corporate executive suites and boardrooms. Just as investor pressure helped to bring about the end of apartheid in South Africa, so can it help us point the way toward an environmentally and socially sustainable global economy.

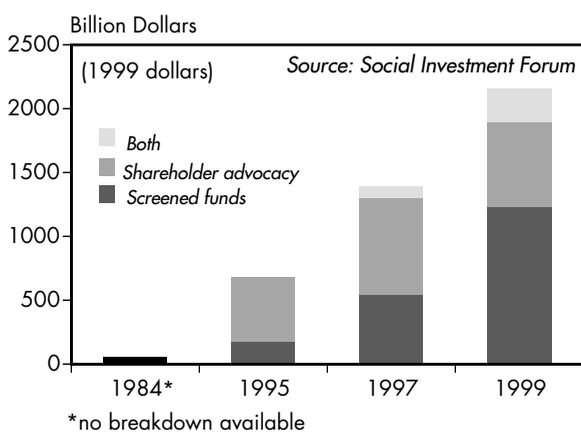


Figure 1: Socially Responsible Investing in the United States, Selected Years

During the 1990s, the economic toll of natural disasters topped \$608 billion, more than the previous four decades combined. Measured in 1999 dollars, losses during the 1990s were more than three times the figure for the 1980s, and more than 15 times the total for the 1950s.¹ (See Figure 1.) The biggest single year for losses in history was 1995, when damages reached \$157 billion.² An earthquake in Kobe, Japan, accounted for more than two thirds of that total.³ For weather-related disasters, 1998 was the biggest year on record, at nearly \$93 billion in recorded losses, with China's Yangtze River flood responsible for more than a third of this total.⁴

Links: pp. 50, 96, 142

While some 500–850 natural disaster events are recorded every year, only a few are classified as “great”—natural catastrophes that result in deaths or losses so high as to require outside assistance, according to Munich Re, a reinsurance company that compiles global disaster data. Over the past 50 years there has been a dramatic increase in the occurrence of great disasters. In the 1950s there were 20 “great” catastrophes, in the 1970s there were 47, and by the 1990s there were 87.⁵

Between 1985 and 1999, Asia sustained 45 percent of the world's economic losses to disasters, North America 33 percent, and Europe 12 percent; the Caribbean, Central America, South America, and Oceania each incurred 2–3 percent of the global losses.⁶ Rural areas and developing nations are in general underrepresented in global disaster data, as reporting systems tend to be weaker, and there is less infrastructure and capital exposure. Africa, with just 1 percent of the global total, is particularly underrepresented because it is rarely hit by major storms or earthquakes.⁷ Most of the disasters in Africa are smaller, or are slow-onset disasters, like droughts, that are not counted in the global tallies.

Asia has been especially hard hit. The region is large and heavily populated, particularly in dangerous river basin and coastal areas. There is frequent seismic and

tropical storm activity. Between 1985 and 1999, Asia suffered 77 percent of all deaths, 90 percent of all homelessness, and 45 percent of all recorded economic losses due to disasters.⁸

Disaster losses often take a big bite out of the economy in poor countries—and in poor households. While the wealthiest countries sustained 57 percent of the measured economic losses to disasters between 1985 and 1999, this represented only 2.5 percent of their gross domestic product (GDP).⁹ In contrast, the poorest countries endured 24 percent of the economic toll of disasters, which added up to 13.4 percent of their GDP, further increasing their vulnerability to future disasters.¹⁰ And in the poorest countries, little if any of the losses are insured. Worldwide, only one fifth of all disaster losses were insured, and 92 percent of these were in industrial nations.¹¹

During the twentieth century, more than 10 million people died from natural catastrophes, according to Munich Re.¹² Between 1985 and 1999, nearly 561,000 lives were lost—77 percent of them in Asia.¹³ Only 4 percent of the fatalities were in industrial countries.¹⁴ Half of all deaths were due to floods.¹⁵ (See Figure 2.) Earthquakes were the second biggest killer, claiming 169,000 lives.¹⁶ In earlier decades and centuries, it was not uncommon for hundreds of thousands of lives to be lost in a single great catastrophe. In the last 20 years, however, there has been only one such event—the cyclone and

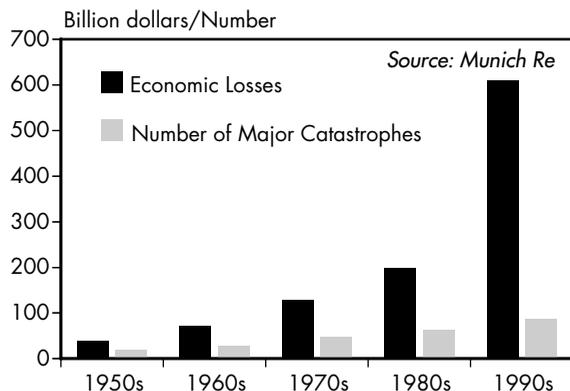


Figure 1: Rising Tide of Major Disasters, by Decade

storm surge that hit Bangladesh in 1991 and took 139,000 lives.¹⁷ Early warnings and disaster preparedness have been a significant factor in keeping the death toll of recent decades from reaching even higher. So, too, have advances in basic services, such as clean water and sanitation. Still, in the 1990s alone more than 2 billion people worldwide were affected by disasters.¹⁸

Around the world, a growing share of the devastation triggered by “natural” disasters stems from ecologically destructive practices and from putting ourselves in harm’s way. By destroying forests, damming rivers, filling in wetlands, and destabilizing the climate, we are unraveling the strands of a complex ecological safety net. Many ecosystems have been frayed to the point where they are no longer resilient and able to withstand natural disturbances, setting the stage for “unnatural disasters”—those made more frequent or more severe due to human actions. The usual approach to natural disturbances is to try to prevent them through methods that all too often exacerbate them. Dams and levees, for example, change the flow of rivers and can increase the frequency and severity of floods and droughts.¹⁹

Two major global social trends have also increased our vulnerability to natural hazards: the migration of people to coasts and cities and the enormous expansion of the built environment. Some 37 percent of the world—more than 2 billion people—lives within 100 kilometers of a coastline.²⁰ Since 1950, the global urban population has increased nearly fourfold; today, almost half the world lives in cities.²¹ Many cities are located near rivers and coasts, further compounding the risks. Of 19 megacities—those with over 10 million inhabitants—13 are in coastal zones.²² In much of the developing world, urbanization presents additional dangers. Up to half the people in the largest cities there live in unplanned squatter colonies, which are often sited in vulnerable areas such as floodplains and hillsides.²³

In the future, our vulnerability to natural disasters will grow further as a result of climate change. The January 2001 report from the

Intergovernmental Panel on Climate Change projects that over the next 100 years, sea levels will rise by 9–88 centimeters, and temperatures will increase by 1.4–5.8 degrees Celsius, bringing additional coastal flooding and more intense storms, among other effects.²⁴ A new report by insurers finds that economic losses related to climate change could top \$304 billion a year in the future.²⁵

While we cannot do away with natural hazards, we can eliminate those that we cause, minimize those we exacerbate, and reduce our vulnerability to most. Doing this requires healthy and resilient communities and ecosystems. Viewed in this light, disaster mitigation is clearly part of a broader strategy of sustainable development—making communities and nations socially, economically, and ecologically sustainable.

The adage “an ounce of prevention is worth a pound of cure” clearly applies to disasters. The World Bank and U.S. Geological Survey calculated that global economic losses from natural disasters could be reduced by \$280 billion if just one seventh that amount were invested in preparedness and mitigation efforts.²⁶ The costs of disaster preparedness and mitigation can be far less than the costs of disaster relief and recovery.

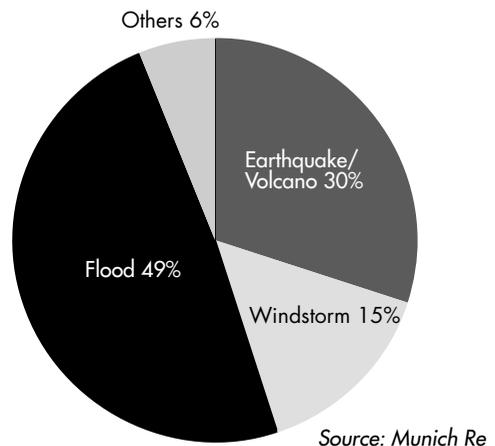


Figure 2: Global Deaths by Disaster Type, 1985–99

Transportation Features



PHOTOGRAPH BY THOMAS RAUPACH/PETER ARNOID, INC..

Urban Rail Systems Gather Steam
Gasoline Taxes Vary Widely

Cities have long built rail lines to increase travel speeds and improve people's access to places. Today, urban rail tracks are concentrated in Europe, the former Soviet republics, and Japan, while the largest demand for urban transportation is in the developing world. Rail alone cannot meet the transport needs of all growing cities, but in many places it could play an important role as part of an integrated strategy.

Urban rail is typically classified as "heavy" or "light." Subways, elevated railways, and metros are all heavy rail, operating on rights-of-way from which all other traffic is excluded.¹ In contrast, light rail—streetcars, tramways, or trolley cars—runs along tracks at street level that may not be separated from other traffic.² In recent years, some cities have found ways to expand the usefulness of their tracks by allowing light rail to use heavy rail lines, and vice versa.³

Urban rail systems are not spread evenly among the world's regions.⁴ (See Table 1.) Western Europe has some 31 percent of the world's metros and 33 percent of its trams.⁵ Buses, automobiles, and subways began to displace some light rail lines in North American cities in the 1920s and in West European cities in the 1930s and 1940s.⁶ But light rail systems were preserved in Eastern Europe and the former Soviet Union, so today this region is home to some 46 percent of those systems.⁷

Recent heavy rail projects have been suggested as an alternative to motor vehicle use in some of the most traffic-clogged regions. Residents of Bangkok, who endure some of the world's longest commutes, welcomed an elevated Skytrain in December 1999.⁸ With one 17-station, 17-kilometer line and another 7-station, 6-kilometer line, this is not yet a complete network, however, and is attracting only 150,000–200,000 riders a day.⁹ In Athens, a 14-station, 13-kilometer underground rail route that opened in January 2000 and an intersecting route that opened in November 2000 are the first links in a subway network that is now serving some 400,000 people daily.¹⁰ The government expects that by reducing the need for people to drive pollution-

belching motor vehicles, the subway system will cut by almost a third the smog that chokes Athens.¹¹ Heavy rail systems are costly to construct, however, and both the Bangkok and Athens projects have encountered delays.

Light rail has become increasingly popular, as it is cheaper than heavy rail yet shares the advantage of increasing land value near stations (which bus routes generally do not). In Western Europe, the resurgence of interest in light rail has reversed a decades-long decline in this form of transport.¹² (See Table 2.) In the United States, light-rail riders are the fastest-growing segment of public transportation riders.¹³ And the number of Americans riding public transport in general is growing faster than those using cars, reaching its highest level in nearly four decades in 2000.¹⁴

Demand for urban transportation is increasing where cities are growing fastest: Latin America, Asia, and Africa. U.N. demographers project a net addition of 2 billion people by 2030, pushing world population over 8 million, but most of the growth will occur in urban areas of the developing world.¹⁵

Table 1: Cities with Urban Rail Systems, by Region, 2000

Region	Heavy Rail	Light Rail
	(number of systems)	
Eastern Europe/Central Asia	15	166
Western Europe ¹	29	119
United States and Canada	17	33
Japan	9	20
Other Asia-Pacific	12	8
Latin America	11	6
Australia and New Zealand	0	6
Africa	1	6
World Total	94	364

¹The 15 members of the European Union plus Switzerland and Norway.

Source: Tony Pattison, ed., *Jane's Urban Transport Systems 2000–2001* (London: 2000), pp. 20–24.

Transit systems could help meet this demand with less damage to the environment than car-based systems. The roads and parking lots needed to accommodate motor vehicles eat up land.¹⁶ By burning fuel, cars release gases and particles that contribute to much of the air pollution in many urban regions.¹⁷ And road traffic is the fastest-growing contributor to climate change.¹⁸

Rail can move people with less space and energy than cars require. In Portland, Oregon, planners estimate that the opening of a new light rail line has saved the region from building eight new parking garages and two extra lanes on major highways.¹⁹ In 1998, rail transit in the United States averaged 12 percent less energy per passenger-kilometer than cars did, although the energy savings of transit has likely increased as transit ridership has grown and the automobile fleet has become less efficient.²⁰

While the up-front cost of rail is high, cities with effective urban transit spend less on transportation over the long run. Researchers at Australia's Institute for Sustainability and Technology Policy (ISTP), led by Peter Newman and Jeffrey Kenworthy, found that auto-dependent Australian and U.S. cities spend 12–13 percent of their per capita wealth on passenger transport, whereas rail-filled cities in Europe and Asia spend less (8 percent in the European cities and 5 percent in Tokyo, Hong Kong, and Singapore).²¹ Developing countries without the means to invest in rail may achieve benefits by setting aside rights-of-way for buses, as Curitiba in Brazil has so effectively done.²² At a later date, dedicated bus lanes might be turned over to rail lines.

To reach the areas that need it most, urban rail will need support from major lending institutions, which often give greater priority to transportation links between cities than to movement within urban regions. Between 1997 and 1999, 63 percent of the World Bank's transportation loans went to highways, while only 15 percent went to urban transport.²³ In Central and Eastern Europe, where many urban rail systems need repair, the European Union's Instrument for Structural Policies for

Table 2: Urban Light Rail Systems in 15 Nations of the European Union, 1930–2000

Year	Number
1930	438
1940	341
1950	272
1960	157
1970	108
1980	91
1990	92
2000	102

Source: 1930–90 from European Commission, *Transport in Figures*, <www.europa.eu.int>, viewed 8 December 2000; 2000 from Tony Pattison, ed., *Jane's Urban Transport Systems 2000–2001* (London: 2000).

Pre-Accession is targeting improvements in long-distance links at the expense of urban transit.²⁴

For rail lines or buses to compete with road vehicles, governments must couple investment in transit with incentives to steer new development toward transit stations. ISTP's researchers have identified a critical threshold below which urban transit is not viable: 30 people per hectare.²⁵ The U.S. cities studied by ISTP have, on average, 14 people per hectare, whereas the European cities have 50.²⁶ A city need not be as crowded as Hong Kong's 300 people per hectare to support effective urban transit; for instance, Stockholm's transit systems work well with only 53 people per hectare.²⁷

A useful urban rail system must connect to other forms of transportation. One of the current shortcomings of Bangkok's new Skytrain is that it lacks adequate bicycle parking and connections to bus routes.²⁸ Bicycles are often not convenient for long trips, and buses and trains are limited to fixed routes. But bicycles and public transit can complement each other when people are able to carry their bikes aboard buses or trains or to park them at stations.

A spike in gasoline prices in 2000 highlighted not only many societies' reliance on oil but also discrepancies in how governments tax it. The price that a driver pays for gas at the pump has two components: production costs and taxes. The cost of producing gasoline includes the price of crude oil, the cost of refining it, and the cost of distributing it. Governments typically impose a fixed excise tax plus a sales tax, which is a percentage of the full production cost plus the excise tax.¹

Fluctuations in crude oil supply and demand influence the first component, production costs. Worldwide, there is a mismatch between the countries that produce oil and those that use it. Many industrial nations rely on oil produced elsewhere to run their vehicles, heat their buildings, and power their factories. The 11 members of the Organization of Petroleum-Exporting Countries (OPEC) produced 40 percent of the world's oil in 2000.² The remainder came from the United States, Canada, the North Sea, and other industrial areas (26 percent); the developing world (24 percent); and the countries of the former Soviet Union (10 percent).³ Most of the demand, in sharp contrast, came from the United States, Japan, and Western Europe.⁴

The cost of producing gasoline rose in 2000 as crude oil demand outstripped supply.⁵ While countries struggled to recover from the financial crisis that began in Asia in 1997, they used less oil, which caused prices to drop. In response, OPEC nations decided to cut back production. So as economies rebounded and demand for oil grew in 2000, supply was low.

Taxes, the other component of gasoline prices, vary widely from country to country.⁶ (See Table 1.) Relatively low U.S. taxes are striking because the United States produces 12 percent of the world's crude oil, yet consumes 26 percent of the total in the

world and uses 43 percent of the world's crude that is made into gasoline.⁷ Despite growing reliance on oil from politically unstable countries and heightened awareness of the environmental harm wrought by fuel use, U.S. taxes have remained relatively constant since the 1930s.⁸ (See Figure 1.)

Dr. Gerhard Metschies, who has surveyed gasoline prices in 132 countries worldwide, identifies four categories of nations.⁹ The benchmarks separating the groups are the tax rates of the nations that use the most gasoline and the untaxed price of gas. Many countries that import all or most of their oil have relatively high taxes. These nations, 45 in all, include not only Japan and those in Western Europe, but also many countries in Eastern Europe, South America, Africa, and Asia. Another 46 countries, mainly oil importers in the developing world, have gasoline prices lower than in Western Europe but higher than

Links:
pp. 40, 68

Table 1: Gasoline Prices, Selected Countries, Fall 2000

Country	Price ¹ (cents per liter)	Tax	Tax Share of Price (percent)
United Kingdom	113	85	76
Japan	102	55	54
France	96	67	69
Italy	95	61	64
Brazil ²	92	60	65
Germany	92	61	67
Spain	73	42	58
India ²	60	28	47
Canada	50	20	41
South Africa ²	50	18	36
United States	41	10	25
China ²	40	8	20
Russia ²	33	1	3
Indonesia ²	17	0	subsidy

¹Unleaded "premium" gasoline pump prices in October 2000 for all countries except Japan, Canada, and the United States, which are unleaded "regular" gasoline pump prices. ²Capital city premium gasoline prices for November 2000; tax is a rough estimate determined by the pump price minus 32¢ per liter untaxed world average price for gasoline. Sources: See endnote 6.

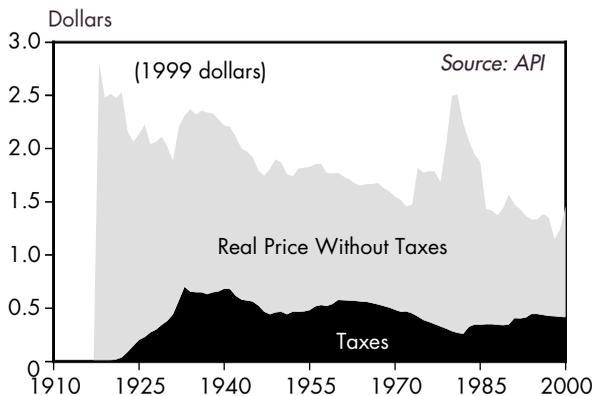


Figure 1: U.S. City Average Retail Gasoline Prices and Taxes, 1918–2000

in the United States. India, South Africa, and Kenya are in this category. A third group (26 countries) has taxes ranging from the level of the United States to no tax at all. While some produce oil, most are net importers. This category includes Libya, Jordan, China, and Russia. Finally, some 15 nations subsidize their gasoline. This group includes net exporters such as Saudi Arabia, Nigeria, and Venezuela, as well as a few net importers such as Sudan.

Many countries could benefit from gradually phasing out subsidies and raising taxes. The gases and particles released when vehicles burn fuel are the single largest contributor to health-threatening air pollution in many urban areas.¹⁰ And even the best pollution-control technologies do not eliminate carbon dioxide, which is a key contributor to climate change.¹¹ By raising gasoline taxes, governments can generate funds for public transportation, discourage excessive driving, and encourage development of alternative fuels and vehicles.

In response to rising crude oil prices, a few Asian governments decided to reduce fuel subsidies in late 2000.¹² Viet Nam announced it was removing import taxes and beginning to cut subsidies.¹³ In Malaysia, where pump prices of unleaded gasoline had remained unchanged since 1983, the nation's finance minister said the subsidies should have been cut years ago.¹⁴ A senior economics minister in

Indonesia noted that some \$100 million in savings from the reduction in fuel subsidies in 2000 would allow the government to increase spending on poverty alleviation and rural infrastructure.¹⁵

Given society's heavy reliance on motor fuels, sudden, sharp price hikes—whether from taxes or production costs—are disruptive. In Europe, the rising price of crude oil on the world market in the fall of 2000 was compounded by a weak European currency.¹⁶

Farmers, truckers, and taxi drivers organized protests from Norway to Italy, and from Spain to Poland.¹⁷ Ironically, many of the protesters requesting tax cuts benefited from those tax revenues: half of the value-added tax on fuel that goes to the European Union supports agricultural programs; most of the rest funds transportation infrastructure.¹⁸ Nonetheless, some governments caved in to pressure; the Dutch government agreed to subsidize taxi, bus, and trucking enterprises, for instance, and the Italian government agreed to fuel discounts for truckers.¹⁹

Dramatic price hikes are particularly distressing for people in developing countries. To appease taxi drivers hurt by the rise in oil prices, Beijing's Transportation Bureau gave them a new subsidy.²⁰ When high crude oil prices combined with a cut in subsidies, fuel prices surged in Indonesia in October 2000, prompting students to vandalize government offices and to take civil servants hostage in protest.²¹ In Cotabato Province in the Philippines, a hike in gasoline prices reflecting the increase in crude oil prices led protesters to explode bombs at several gasoline stations.²² Gerhard Metschies concludes that to avoid protests, no single increase in price should exceed more than 10 percent of the pump price.²³ Rather, a steady series of small price adjustments would be better.

FOSSIL FUEL USE FALLS AGAIN (pages 40–41)

1. Data for 1950–99 data based on United Nations, *World Energy Supplies 1950–74* (New York: 1976), p. 3, and on BP Amoco, *Statistical Review of World Energy June 2000* (London: Group Media & Publications, June 2000), pp. 9, 25, 33; Worldwatch preliminary estimate for 2000 based on *ibid.*, on U.S. Department of Energy (DOE), Energy Information Administration (EIA), *Monthly Energy Review, December 2000* (Washington, DC: 2000), p. 7, on David Fridley, Lawrence Berkeley National Laboratory (LBL), e-mail to author, 24 January 2001, on International Energy Agency (IEA), *Oil, Gas, Coal and Electricity Quarterly Statistics, Second Quarter* (Paris: Organisation for Economic Co-operation and Development (OECD)/IEA, 2000), pp. 400–01, 446–47, on *ibid.*, *Monthly Oil Market Report* (Paris: OECD/IEA, 11 December 2000), pp. 4–14, and on International Gas Union (IGU), “World Gas Review,” IGU Council Meeting, Japan, October 2000, p. 3.
2. BP Amoco, *op. cit.* note 1.
3. *Ibid.*
4. Based on United Nations, *op. cit.* note 1, p. 3, on BP Amoco, *op. cit.* note 1, on DOE, *op. cit.* note 1, on LBL, *op. cit.* note 1, on IEA, *Oil, Gas, Coal*, *op. cit.* note 1, on *ibid.*, *Monthly Oil*, *op. cit.* note 1, and on IGU, *op. cit.* note 1.
5. DOE, *op. cit.* note 1.
6. BP Amoco, *op. cit.* note 1, p. 33; Fridley, *op. cit.* note 1.
7. BP Amoco, *op. cit.* note 1, p. 33; Fridley, *op. cit.* note 1.
8. IEA, *Oil, Gas, Coal and Electricity*, *op. cit.* note 1, p. 446.
9. BP Amoco, *op. cit.* note 1, p. 9; IEA, *Monthly Oil Market Report*, *op. cit.* note 1, p. 4.
10. BP Amoco, *op. cit.* note 1, p. 9; DOE, *op. cit.* note 1.
11. BP Amoco, *op. cit.* note 1, p. 9; IEA, *Monthly Oil Market Report*, *op. cit.* note 1, p. 4.
12. BP Amoco, *op. cit.* note 1, p. 9; IEA, *Monthly Oil Market Report*, *op. cit.* note 1, p. 4.
13. BP Amoco, *op. cit.* note 1, p. 25; IGU, *op. cit.* note 1.
14. BP Amoco, *op. cit.* note 1, p. 9; DOE, *op. cit.* note 1.
15. IGU, *op. cit.* note 1, p. 2.
16. *Ibid.*
17. International Monetary Fund, *The Impact of Higher Oil Prices on the Global Economy* (Washington, DC: 8 December 2000); “Worldwide Look at Reserves and Production,” *Oil & Gas Journal*, 18 December 2000, p. 123; BP Amoco, *op. cit.* note 1, p. 14; DOE, *op. cit.* note 1, p. 115.
18. Neela Banerjee, “As Oil Prices Decline, Natural Gas Threatens to Upset the Trend,” *New York Times*, 18 December 2000.
19. John Varoli, “Energy On Ice,” *New York Times*, 3 October 2000.
20. DOE, EIA, *Potential Oil Production from the Coastal Plain of the Arctic National Wildlife Refuge: Updated Assessment* (Washington, DC: 2000), p. 2; Worldwatch estimate based on *ibid.* and on BP Amoco, *op. cit.* note 1, p. 9.
21. IEA, *World Energy Outlook 2000* (Paris: OECD/IEA, 2000), p. 22.
22. *Ibid.*
23. *Ibid.*, p. 23.
24. *Ibid.*, p. 22.
25. *Ibid.*, pp. 22–23.
26. *Ibid.*, p. 21.

NUCLEAR POWER INCHES UP (pages 42–43)

1. Installed nuclear capacity is defined as reactors connected to the grid as of 31 December 2000, and is based on Worldwatch Institute database compiled from statistics from the International Atomic Energy Agency and press reports primarily from

- Associated Press, Reuters, Agence FrancePresse, Uranium Institute News Briefing, and Web sites.*
2. Worldwatch Institute database, op. cit. note 1.
 3. Ibid.
 4. Ibid.
 5. Ibid.
 6. Ibid.
 7. See, for example, "FERC OKs Millstone Nuclear Plant Sale to Dominion," *Reuters*, 24 January 2001.
 8. "Germany Renounces Nuclear Power," *BBC News*, <news.bbc.co.uk>, viewed 15 June 2000.
 9. "UK," *Uranium Institute News Briefing*, 17–23 May 2000.
 10. "Sweden," *Uranium Institute News Briefing*, 27 September–3 October 2000.
 11. "France," *Uranium Institute News Briefing*, 22–28 November 2000.
 12. "Chernobyl Reactor Restarts Before Final Shutdown," *Agence Press de France*, 1 December 2000.
 13. "Fuel Extracted from Mothballed Kazakh Nuclear Reactor," *BBC Monitoring Former Soviet Union*, via EnergyCentral <energycentral.com>, viewed 21 November 2000.
 14. Vladimir Sliviyak, Socio-Ecological Union, Moscow, e-mail to author, 25 January 2001.
 15. CEZ, s.a., "Temporary Tripping of the Turbine," press release, <cez.cz/jete/tednes/NewsEN>, viewed 4 January 2001.
 16. "Austrians Blockade Border to Protest Czech Nuclear Plant," *Agence Press de France*, 2 September 2000.
 17. "Japan," *Uranium Institute News Briefing*, 19–25 April 2000.
 18. Department of Atomic Energy (India), "Nuclear Power in India," <dae.gov.in/power.htm>, viewed 4 January 2001.
 19. Ibid.
 20. Emma Davies, "The Nuclear Industry Learns Its Market Value," *Nuclear Engineering International*, 30 June 2000.
 21. "Cuba," *Uranium Institute News Briefing*, 13–19 December 2000.
 22. "Update 3 Turkey Puts Nuke Power Plans on Indefinite Hold," *Reuters*, 25 July 2000.
 23. "Taiwan Scraps Fourth Nuclear Power Plant," *Power Engineering International*, December 2000.
 24. "Operation of Taiwan's Nuclear Power Plant to be Delayed," *Xinhua News Agency*, 14 February 2001, via EnergyCentral <energycentral.com>, viewed 15 February 2001.
 25. "Final Agreement Between Framatome and Siemens," *Nuclear Notes from France*, August–September 2000.
 26. ABB, "ABB's Sale of Nuclear Business to BNFL Closes," press release, 2 May 2000.
 27. "The Shaw Group Inc. Submits Bid for Assets of Stone & Webster, Inc.," *Business Wire*, <business.wire.com>, viewed 6 July 2000.
- WIND ENERGY GROWTH CONTINUES
(pages 44–45)
1. Worldwatch Institute preliminary estimate based on figures from Birger Madsen, BTM Consult, e-mail to author, 16 February 2001, on "Windicator," *Windpower Monthly*, January 2001, p. 46, on Andreas Wagner, European Wind Energy Association, e-mail to author, 29 January 2001, on "Another Year of Records—Wind Power Growth in 2000," *New Energy*, February 2001, p. 44, and on American Wind Energy Association (AWEA), *Global Wind Energy Market Report* (Washington, DC: January 2001); historical data in Figures 1 and 2 from BTM Consult, *International Wind Energy Development: World Market Update, 1999* (Ringkøbing, Denmark: March 2000).
 2. BTM Consult, op. cit. note 1.
 3. AWEA, *Wind Energy Press Background Information* (Washington, DC: February 2001).
 4. Christian Hinsch, "Wind Power Flying Even Higher," *New Energy*, February 2001, pp. 14–20.
 5. Worldwatch estimate based on Madsen, op. cit. note 1, on "Windicator," op. cit. note 1, on Wagner, op. cit. note 1, on "Another Year of Records," op. cit. note 1, and on AWEA, op. cit. note 1. Annual capacity additions are not additive to determine total capacity since the latter figures are adjusted to reflect turbine retirements.
 6. AWEA, op. cit. note 1. Estimates of U.S. installations in 2000 range from AWEA's 53 megawatts to BTM's 175 megawatts. The wide difference reflects the fact that some turbines shipped or delivered in December 2000 may not have begun generating electricity until January 2001.
 7. AWEA, op. cit. note 1; Executive Office of the President of the United States, *A Blueprint for New Beginnings: A Responsible Budget for America's Priorities* (Washington, DC: 28 February 2001).
 8. Hinsch, op. cit. note 4.
 9. Ibid.
 10. Ibid.
 11. According to Andreas Wagner, vice president of the European Wind Energy Association, cited in Claire-Louise Isted, "German Offshore Wind Power Key to European Target," *Reuters*, 23 January 2001.

- ary 2001.
12. Estimate based on Madsen, op. cit. note 1.
 13. Torgny Møller, "The End of the Beginning," *Windpower Monthly*, September 2000, pp. 43–44.
 14. Ibid.
 15. Estimate based on Madsen, op. cit. note 1.
 16. "Spain Status Report," *Wind Directions*, March 2001, pp. 13–17.
 17. "Another Year of Records," op. cit. note 1.
 18. "Government Backs 3,000 MW Target," *Wind Directions*, November 2000, p. 3.
 19. Karl Royce and Michael McGovern, "Problems Ahead for Argentina Ambitions," *Windpower Monthly*, February 2001, pp. 21–22.
 20. "Danes Open Shop," *Windpower Monthly*, January 2001, p. 10.
 21. Frank Sieren, "A Fit of the Doldrums," *New Energy*, February 2001, pp. 32–34.
 22. David Milborrow, "Looking More Competitive than Ever," *Windpower Monthly*, January 2001, pp. 32–33; AWEA, "Wind Energy's Costs Hit New Low," press release (Washington, DC: 6 March 2001).
 23. Milborrow, op. cit. note 22; Jim Carlton, "As Demands for Energy Multiply, Windmill Farms Stage a Comeback," *Wall Street Journal*, 26 January 2001; Rebecca Smith and John R. Emshwiller, "California Agrees to Spend \$40 Billion to Buy Power Under 10-Year Agreements," *Wall Street Journal*, 6 March 2001.
- #### SOLAR POWER MARKET SURGES
- (pages 46–47)
1. Paul Maycock, *PV News*, letter to author, 28 February 2001.
 2. Ibid.
 3. Ibid.
 4. "World Cell/Module Production Grows 38% to 277.90 MW," *PV News*, February 2001, p. 1.
 5. "Sharp Increases PV Production," *PV News*, February 2001, p. 5.
 6. Ibid.
 7. Ibid.
 8. Ibid.
 9. "World Cell/Module Production Grows," op. cit. note 4.
 10. Ibid.
 11. U.S. Department of Energy, "Million Solar Roofs," <www.eren.doe.gov/millionroofs>, viewed on 27 February 2001.
 12. Stella Danker, "Sunshine States," *The BP Magazine*, Issue Three 2000, pp. 37–38.
 13. "European PV Production in 2000 Gains 46% Over 1999," *PV News*, February 2001, p. 4.
 14. Paul Maycock, "The World PV Market 2000: Shifting from Subsidy to 'Fully Economic'?" *Renewable Energy World*, July–August 2000, pp. 59–74.
 15. Ibid.
 16. Ibid.
 17. Eric Martinot, "Renewable Energy Markets and the Global Environment Facility," *Renewable Energy Report*, February 2000, pp. 18–22.
 18. "Revised Forecast," *PV News*, November 2000, p. 1.
 19. Rene Karotki and Douglas Banks, "PV Power and Profit? Electrifying Rural South Africa," *Renewable Energy World*, January–February 2000, pp. 50–59.
 20. Ibid.
- #### GLOBAL TEMPERATURE STEADY
- (pages 50–51)
1. J. Hansen, "Global Land-Ocean Temperature Index in .01 C," <www.giss.nasa.gov/data/update/gistemp>, viewed 20 January 2001.
 2. Ibid.
 3. J. Hansen, "Global Temperature Anomalies in .01 C," <www.giss.nasa.gov/data/update/gistemp>, viewed 20 January 2001.
 4. Ibid.; Hansen, op. cit. note 1.
 5. National Climatic Data Center, "Climate of 2000—Annual Review," 12 January 2001, <www.ncdc.noaa.gov/ol/climate/research>, viewed 23 January 2001.
 6. Ibid.
 7. Ibid.
 8. Ibid.
 9. Ibid.
 10. Ibid.
 11. Ibid.
 12. Ibid.
 13. Ibid.
 14. Intergovernmental Panel on Climate Change, *Climate Change 2001: The Scientific Basis*, Summary for Policymakers, <www.ipcc.ch>, viewed 22 January 2001.
 15. Ibid., p. 8.
 16. Ibid.
 17. Ibid.
 18. Ibid.
 19. Ibid, p. 10.
 20. Ibid, p. 9.
 21. Ibid.
 22. Ibid.
 23. Ibid., p. 8.

24. National Assessment Synthesis Team, U.S. Global Change Research Program, *Climate Change Impacts on the United States* (New York: Cambridge University Press, 2000), p. 6.
25. *Ibid.*

CARBON EMISSIONS CONTINUE DECLINE (pages 52–53)

1. Historical trends and preliminary 2000 estimate based on G. Marland, T.A. Boden, and R.J. Andres, "Global, Regional, and National CO₂ Estimates from Fossil Fuel Burning, Cement Production, and Gas Flaring: 1751–1997 (Revised August 2000)," Carbon Dioxide Information Analysis Center, Oak Ridge National Laboratory, Oak Ridge, TN, 22 August 2000, on BP Amoco, *Statistical Review of World Energy 2000* (London: Group Media & Publications, June 2000), pp. 9, 25, 33, on U.S. Department of Energy (DOE), Energy Information Administration (EIA), *Monthly Energy Review, December 2000* (Washington, DC), p. 7, on David Fridley, Lawrence Berkeley National Laboratory, e-mail to author, 24 January 2001, on International Energy Agency (IEA), *Oil, Gas, Coal and Electricity Quarterly Statistics, Second Quarter* (Paris: Organisation for Economic Co-operation and Development (OECD)/IEA, 2000), pp. 400–01, 446–447, on *idem*, *Monthly Oil Market Report* (Paris: OECD/IEA, 11 December 2000), pp. 4–14, and on International Gas Union (IGU), "World Gas Review," IGU Council Meeting, Japan, October 2000, p. 3.
2. Worldwatch estimate based on Marland, Boden, and Andres, op. cit. note 1, on BP Amoco, op. cit. note 1, on DOE, op. cit. note 1, on Fridley, op. cit. note 1, on IEA, *Oil, Gas, Coal and Electricity*, op. cit. note 1, on *idem*, *Monthly Oil Market Report*, op. cit. note 1, and on IGU, op. cit. note 1.
3. Historical trends and 2000 estimate based on Marland, Boden, and Andres, op. cit. note 1, on BP Amoco, op. cit. note 1, on DOE, op. cit. note 1, p. 7, on Fridley, op. cit. note 1, on IEA, *Oil, Gas, Coal and Electricity*, op. cit. note 1, on *idem*, *Monthly Oil Market Report*, op. cit. note 1, on IGU, op. cit. note 1, and on International Monetary Fund (IMF), *World Economic Outlook* (Washington, DC: October 2000), p. 197.
4. Worldwatch estimate based on Marland, Boden, and Andres, op. cit. note 1, on BP Amoco, op. cit. note 1, on DOE, op. cit. note 1, on Fridley, op. cit. note 1, on IEA, *Oil, Gas, Coal and Electricity*, op. cit. note 1, on *idem*, *Monthly Oil Market Report*, op. cit. note 1, on IGU, op. cit. note 1, on Angus Maddison, *Monitoring the World Economy, 1820–1992* (Paris: OECD, 1995), and on IMF, op. cit. note 3.
5. Earth Negotiations Bulletin (ENB), "Summary of the Sixth Conference of the Parties to the Framework Convention on Climate Change: 13–25 November 2000," <www.iisd.ca/climate/cop6>, viewed 10 January 2001, p. 2.
6. Worldwatch estimate based on IEA, *CO₂ Emissions from Fossil Fuel Combustion (2000 Edition)* (Paris: OECD/IEA, 2000), p. xix, and on BP Amoco, op. cit. note 1.
7. Worldwatch estimate based on IEA, op. cit. note 6, and on BP Amoco, op. cit. note 1.
8. Worldwatch estimate based on IEA, op. cit. note 6, and on BP Amoco, op. cit. note 1.
9. Worldwatch estimate based on IEA, op. cit. note 6, and on BP Amoco, op. cit. note 1.
10. Worldwatch estimate based on IEA, op. cit. note 6, and on BP Amoco, op. cit. note 1.
11. Worldwatch estimate based on IEA, op. cit. note 6, and on BP Amoco, op. cit. note 1.
12. Worldwatch estimate based on Marland, Boden, and Andres, op. cit. note 1, on BP Amoco, op. cit. note 1, on Maddison, op. cit. note 4, and on IMF, op. cit. note 3.
13. C.D. Keeling and T.P. Whorf, "Atmospheric CO₂ Concentrations (ppmv) Derived From In Situ Air Samples Collected at Mauna Loa Observatory, Hawaii," Scripps Institution of Oceanography, La Jolla, CA, 16 August 2000; Timothy Whorf and C.D. Keeling, Scripps Institution of Oceanography, e-mail to author, 6 February 2001.
14. Intergovernmental Panel on Climate Change (IPCC), *Climate Change 2001: The Scientific Basis, Summary for Policymakers*, <www.ipcc.ch>, viewed 22 January 2001, p. 4.
15. *Ibid.*
16. James Hansen et al., "Global Warming in the Twenty-First Century: An Alternative Scenario," *Proceedings of the National Academy of Sciences*, 16 June 2000, p. 1.
17. *Ibid.*, p. 2.
18. *Ibid.*, p. 1.
19. IPCC, *Special Report on Emissions Scenarios, Summary for Policymakers*, <www.ipcc.ch>, viewed 12 January 2001.
20. *Ibid.*
21. ENB, op. cit. note 5, p. 1.
22. *Ibid.*
23. *Ibid.*
24. *Ibid.*
25. *Ibid.*

26. Ibid, p. 19.

WORLD ECONOMY EXPANDS (pages 56–57)

1. Worldwatch update of Angus Maddison, *Monitoring the World Economy 1820–1992* (Paris: Organisation for Economic Co-operation and Development, 1995), using deflators and recent growth rates from International Monetary Fund (IMF), *World Economic Outlook* (Washington, DC: October 2000).
2. IMF, op. cit. note 1; U.S. Bureau of the Census, *International Data Base*, electronic database, Suitland, MD, updated 10 May 2000.
3. IMF, op. cit. note 1.
4. Ibid.
5. Ibid.
6. Ibid.
7. Ibid.
8. Ibid.
9. Ibid.
10. Ibid.
11. Ibid.
12. Ibid.
13. World Bank, *World Development Report 2000/2001* (New York: Oxford University Press, 2000), pp. 21–23.
14. Crop data from U.S. Department of Agriculture, *Production, Supply, and Distribution*, electronic database, Washington, DC, updated December 2000.
15. IMF, op. cit. note 1.
16. Ibid.
17. Ibid.
18. Ibid.
19. Oil and gas commodity prices from IMF, *International Financial Statistics Yearbook* (Washington, DC: various years).
20. IMF, op. cit. note 1.
21. Ibid.
22. Ibid.
23. Ibid.
24. Ibid.
25. Ibid.
26. Ibid.; U.N. Office for the Coordination of Humanitarian Affairs, “Iran: Drought Threatens Devastating Consequences,” Integrated Regional Information Networks, on-line news brief, <www.reliefweb.int/IRIN/asia/countrystories/iran/20000823.phtml>, 23 August 2000.
27. IMF, op. cit. note 1.
28. Ibid.
29. Ibid.; United Nations, op. cit. note 2.
30. IMF, op. cit. note 1.

31. Ibid.

32. Ibid.

FOREIGN DEBT UNCHANGED (pages 58–59)

1. World Bank, *Global Development Finance 2000*, electronic database, Washington, DC, 2000; idem, *Global Development Finance 2001* (advance release), electronic database, Washington, DC, 2001.
2. World Bank, *Global Development Finance 2001*, op. cit. note 1.
3. Ibid.
4. Ibid.
5. Ibid.
6. Ibid.
7. Ibid.
8. Ibid.
9. Ibid.
10. Mahn-Je Kim, “The Republic of Korea’s Successful Economic Development and the World Bank,” in Devesh Kapur, John P. Lewis, and Richard Webb, eds., *The World Bank: Its First Half Century*, vol. 2 (Washington, DC: Brookings Institution Press, 1997), p. 25; Susan M. Collins and Won-Am Park, “External Debt and Macroeconomic Performance in South Korea,” in Jeffrey D. Sachs, ed., *Developing Country Debt and the World Economy* (Chicago: University of Chicago Press, 1989), pp. 129–30.
11. Karin Lissakers, *Banks, Borrowers, and the Establishment: A Revisionist Account of the International Debt Crisis* (New York: BasicBooks, 1991), pp. 60–83.
12. Edward F. Buffie and Allen Sangines Krause, “Mexico 1968–86: From Stabilizing Development to the Debt Crisis,” in Sachs, op. cit. note 10, p. 156.
13. Wilfredo Cruz and Robert Repetto, *The Environmental Effects of Stabilization and Structural Adjustment Programs: The Philippines Case* (Washington, DC: World Resources Institute, 1992), p. 50.
14. World Bank, *Global Development Finance 2000*, op. cit. note 1; idem, *Global Development Finance 2001*, op. cit. note 1.
15. Ibid. These figures somewhat overstate the region’s debt burden since they treat concessional loans from aid agencies—which often charge almost no interest—the same as they treat more-burdensome commercial loans.
16. World Bank, *Global Development Finance 2000*, vol. 1 (Washington, DC: 2000), p. 156.
17. Figure of 45 percent is a Worldwatch estimate

based on World Bank, Debt Initiative for Heavily Indebted Poor Countries, <www.worldbank.org/hipc>, viewed 24 October 2000, on idem, *Global Development Finance 2001*, op. cit. note 1, and on idem, *Global Development Finance 2000*, vol. 1 (Washington, DC: 2000), pp. 144–46.

18. David Malin Roodman, *Still Waiting for the Jubilee: Pragmatic Solutions for the Third World Debt Crisis*, Worldwatch Paper 155 (Washington, DC: Worldwatch Institute, April 2001).

U.N. FUNDS STAY ON ROLLER COASTER (pages 60–61)

1. Compiled by author from current-dollar data provided in Klaus Hübner, “Assessments of Specialized Agencies 1971–2001,” “Expenditures of UN Specialized Agencies’ Voluntarily-Financed Activities: 1971–1999,” and “Voluntary Contributions: 1971–1999,” all at Global Policy Forum, <www.globalpolicy.org/finance/tables/>, viewed 16 February 2001; in U.N. General Assembly, “Budgetary and Financial Situation of Organizations of the United Nations System,” A/55/525, 26 October 2000, Tables 7 and 8; and in Executive Board of the U.N. Development Programme and the U.N. Population Fund, “Annual Report of the Administrator for 1999 and Related Matters. Statistical Annex,” DP/2000/23/Add.2, 15 May 2000.
2. U.N. General Assembly, op. cit. note 1, Table 1.
3. Klaus Hübner, “Assessed Payments to the Regular Budget and Specialized Agencies: 1971–2001,” Global Policy Forum, <www.globalpolicy.org/finance/tables/fintab.htm>, viewed 16 February 2001; idem, “Expenditures of UN Specialized Agencies’ Voluntarily-Financed Activities,” and “Voluntary Contributions,” op. cit. note 1.
4. Author’s calculation based on Hübner, op. cit. note 1.
5. Ibid.
6. Calculated from Hübner, “Voluntary Contributions,” op. cit. note 1.
7. Author’s calculation based on Hübner, op. cit. note 1, on U.N. General Assembly, op. cit. note 1, and on Executive Board, op. cit. note 1.
8. Klaus Hübner, “List of Members Paying Promptly and Fully 1991–1999,” Global Policy Forum, <www.globalpolicy.org/finance/tables/honroll.htm>, viewed 27 September 2000.
9. United Nations, Office of the Spokesman for the Secretary-General, “Payments to the UN Regular Budget for 2001,” <www.un.org/News/ocsg/hon2001.htm>, viewed 20 February 2001.

10. Hübner, op. cit. note 8; United Nations, op. cit. note 9.
11. U.N. General Assembly (26 October 2000, 6 November 1998, 18 October 1996), op. cit. note 1, Table 5.
12. Calculated by author from data in Klaus Hübner, “Specialized Agencies: Collection of Assessed Contributions 1971–1999,” Global Policy Forum, <www.globalpolicy.org/finance/tables/collect.htm>, viewed 17 February 2001.
13. Ibid.
14. These numbers include arrears for current and past years, at the end of the calendar year; Klaus Hübner, “Outstanding Debts to the UN Regular Budget 1971–1999,” Global Policy Forum, <www.globalpolicy.org/finance/tables/tab5.htm>, viewed 31 January 2001; “US vs. Total Debt to the UN: 2000,” Global Policy Forum, <www.globalpolicy.org/finance/tables/dbttab00.htm>, viewed 31 January 2001.
15. Calculated by author from U.N. General Assembly (26 October 2000, 6 November 1998, 18 October 1996), op. cit. note 1, Table 5.
16. Amb. Richard Holbrooke, U.S. Permanent Representative to the United Nations, “Remarks at UN Headquarters on Reform of the UN Scales of Assessment,” 22 December 2000.
17. U.S. Department of State, “U.S. Plan for Paying UN Arrears,” fact sheet (Washington, DC: Bureau of International Organization Affairs, 24 October 2000).

FOOD TRADE SLUMPS (pages 62–63)

1. U.N. Food and Agriculture Organization (FAO), *FAOSTAT Statistics Database*, <apps.fao.org/>, updated 27 October 2000.
2. Ibid.
3. Peter Uvin, *The International Organization of Hunger* (London: Kegan Paul International, 1994), pp. 92–128.
4. Ibid.
5. FAO, op. cit. note 1.
6. World Trade Organization (WTO), *WTO Annual Report 1998—Special Topic: Globalization and Trade* (Geneva: 1998).
7. WTO, *International Trade Statistics 2000* (Geneva: 2000).
8. FAO, op. cit. note 1.
9. Hilary French, *Vanishing Borders* (New York: W.W. Norton & Company, 2000), p. 51.
10. FAO, op. cit. note 1.
11. Ibid.

12. Ibid.
 13. U.S. Bureau of Transportation Statistics and U.S. Bureau of the Census, *1997 Commodity Flow Survey Report on Exports* (Washington, DC: April 2000).
 14. FAO, op. cit. note 1.
 15. Ibid.
 16. Ibid.
 17. Ibid.
 18. Ibid.
 19. Fileman Torres et al., *Agriculture in the Early XXI Century: Agrodiversity and Pluralism as a Contribution to Address Issues on Food Security, Poverty, and Natural Resource Conservation* (draft) (Rome: Global Forum on Agricultural Research, April 2000), p. 14.
 20. Ibid.
 21. Uvin, op. cit. note 3; FAO, "Issues and Options in the Forthcoming WTO Negotiations from the Perspective of Developing Countries, Paper No 3: Synthesis of Country Case Studies," FAO Symposium on Agriculture, Trade and Food Security, Geneva, 23–24 September 1999.
 22. *Food Miles—Still on the Road to Ruin?* (London: Sustain—The Alliance for Better Food and Farming, October 1999), p. 6.
 23. Ibid.
- ALUMINUM PRODUCTION KEEPS GROWING (pages 64–65)
1. Aluminum and bauxite production from U.S. Geological Survey (USGS), *Mineral Commodity Summaries 2001* (Washington, DC: Government Printing Office, 2001), pp. 18–19, and from Patricia A. Plunkert, commodity specialist, USGS, Reston, VA, e-mail to author, 15 November 2000.
 2. USGS, op. cit. note 1.
 3. Ibid.; U.S. Bureau of the Census, *International Data Base*, electronic database, updated 10 May 2000.
 4. USGS, op. cit. note 1; it takes two to three tons of bauxite to produce one ton of alumina, and two tons of alumina to produce one ton of aluminum; International Aluminium Institute (IAI), "Aluminium Production," <www.world-aluminium.org/production/index.html>, viewed 13 February 2001.
 5. USGS, op. cit. note 1.
 6. U.S. share of world aluminum production from USGS, op. cit. note 1; the United States accounted for about 40 percent of world primary aluminum production in the mid-1960s, according to Plunkert, op. cit. note 1, and idem, *Aluminum Statistical Compendium* (Reston, VA: USGS, 5 September 1998).
 7. USGS, op. cit. note 1; Plunkert, op. cit. note 1.
 8. Worldwatch Institute estimate, based on USGS, op. cit. note 1, and on Patricia A. Plunkert, commodity specialist, USGS, Reston, VA, discussion with author, 1 February 2001.
 9. USGS, op. cit. note 1.
 10. Wayne Wagner, "Aluminum," *Canadian Minerals Yearbook, 1999* (Ottawa, ON, Canada: Natural Resources Canada, 2000), p. 8.16.
 11. Ibid.
 12. Ibid.
 13. Patricia A. Plunkert, "Aluminum," *Engineering & Mining Journal*, April 2000, p. 39.
 14. European Aluminum Association, *Aluminum Industry in Europe—Key Statistics for 1999* (Brussels: June 2000).
 15. Plunkert, op. cit. note 13.
 16. IAI, "Energy Use," <www.world-aluminium.org/environment/challenges/energy.html>, viewed 13 February 2001; the average U.S. household used 10,210 kilowatt-hours in 1997, according to U.S. Department of Energy (DOE), Energy Information Administration, *A Look at Residential Energy Consumption in 1997* (Washington, DC: 1999), p. 113.
 17. Smelter energy use is a Worldwatch estimate, based on production data from USGS, op. cit. note 1, and on electricity consumption per ton of aluminum production from IAI, op. cit. note 16.
 18. IAI, "Electrical Power Used in Primary Aluminium Production—Form ES002," <world-aluminium.org/iai/stats/es002.html>, viewed 20 December 2000.
 19. Intergovernmental Panel on Climate Change, *IPCC Special Report on Emissions Scenarios* (Geneva: 2000), p. 3.6.6.
 20. IAI, op. cit. note 16.
 21. Worldwatch estimates of annual electricity use in aluminum production based on IAI, op. cit. note 16, on USGS, op. cit. note 1, and on Plunkert, op. cit. note 1.
 22. Wagner, op. cit. note 10, p. 8.13.
 23. U.S. Environmental Protection Agency, *Characterization of Municipal Solid Waste in the United States: Source Data on the 1999 Update* (Washington, DC: May 2000).
 24. Energy savings is a Worldwatch estimate, based on IAI, op. cit. note 16, on Wagner, op. cit. note 10, on DOE, op. cit. note 16, and on U.S. Bureau of the Census, *1990 Census Lookup*, electronic database, updated 12 February 2001.

VEHICLE PRODUCTION SETS NEW RECORD (pages 68–69)

1. Standard and Poor's DRI, *World Car Industry Forecast Report, December 2000* (London: 2000); earlier data from idem, *World Car Industry Forecast Report, December 1999* (London: 1999), and from American Automobile Manufacturers Association (AAMA), *World Motor Vehicle Facts and Figures 1998* (Washington, DC: 1998).
2. DRI, *December 2000*, op. cit. note 1. Light trucks are vehicles up to 6 tons in weight and include the increasingly popular "sports utility vehicles."
3. Colin Couchman, Global Automotive Group, Standard and Poor's DRI, London, e-mail to author, 13 February 2001.
4. Ward's Communications, *Ward's World Motor Vehicle Data 2000* (Southfield, MI: 2000); DRI, *December 2000*, op. cit. note 1.
5. Ward's Communications, op. cit. note 4; DRI, *December 2000*, op. cit. note 1.
6. Ward's Communications, op. cit. note 4, various tables; DRI, *December 2000*, op. cit. note 1.
7. According to forecasts to 2005, Brazil, China, and India will increase their passenger car production by 78 percent, from 2.6 million in 2000 to 4.6 million in 2005. DRI, *December 2000*, op. cit. note 1.
8. DRI, *December 2000*, op. cit. note 1.
9. Ibid.
10. Ibid.
11. Ibid.
12. Pricewaterhouse Coopers, "Autofacts World Summary," 2000, <www.autofacts.com>, viewed 28 December 2000.
13. Ibid.
14. Automobile industry merger data from Carrie Smith, Thomson Financial Securities Data, Newark, NJ, e-mail to author, 20 December 2000.
15. Keith Bradsher, "Gentlemen, Merge Your Manufacturers," *New York Times*, 23 March 2000; Stephanie Strom, "DaimlerChrysler Buying a Third of Mitsubishi for \$2.1 Billion," *New York Times*, 28 March 2000.
16. Worldwatch calculations based on Ward's Communications, op. cit. note 4, on Pricewaterhouse Coopers, op. cit. note 12, and on newspaper reports cited throughout the notes.
17. This calculation counts the portion of a company owned by another firm as part of the acquiring firm's market share. For instance, it counts 20 percent of Fiat's production under General Motors, in accord with the latter's 20-percent stake in Fiat; Keith Bradsher with Andrew Ross Sorkin, "Fiat

Weights Sale to G.M. of a Stake in Auto Line," *New York Times*, 13 March 2000.

18. U.S. General Accounting Office (GAO), *Automobile Fuel Economy: Potential Effects of Increasing the Corporate Average Fuel Economy Standards* (Washington, DC: August 2000), p. 10.
19. "Auto Firms' CO₂ Pact With EU Lacks Teeth," *Environment News Service*, 12 January 2001.
20. U.S. Department of Energy (DOE) forecast reported in Michael T. Klare, "Resource Competition and World Politics in the Twenty-First Century," *Current History*, December 2000, p. 404.
21. U.S. Federal Highway Administration, "Highway Statistics Summary to 1995" and "Highway Statistics 1999," <www.fhwa.dot.gov/>, viewed 2 February 2001; projection to 2020 from DOE, *Annual Energy Outlook 2001* (Washington, DC: 2001).
22. U.K. Government, "Achieving a Better Quality of Life," *Annual Report 2000*, <www.sustainable-development.gov.uk/ann_rep/ch3/h11.htm>, viewed 30 January 2001.
23. GAO, op. cit. note 18, p. 7.
24. DOE, op. cit. note 21.
25. Ibid.

BICYCLE PRODUCTION RECOVERS (pages 70–71)

1. Estimate for 1999 based on data from "World Market Report," in Bicycle Retailer and Industry News, *Industry Directory 2001* (Santa Fe, NM: Bill Communications, 2001), pp. 6, 10, and from United Nations, *Industrial Commodity Statistics Yearbook 1998* (New York: 1999).
2. "World Market Report," op. cit. note 1; United Nations, op. cit. note 1.
3. "World Market Report," op. cit. note 1, p. 6.
4. Ibid.
5. Ibid.
6. Ibid.
7. Worldwatch calculation based on ibid., and on United Nations, op. cit. note 1.
8. "World Market Report," op. cit. note 1, p. 6.
9. Ibid.
10. Ibid.
11. Ibid., pp. 6, 18.
12. Ibid., p. 18.
13. Ibid., p. 6.
14. Frank Jamerson, Electric Battery Bicycle Company, e-mail to author, 2 February 2001.
15. Ed Benjamin, Electric Cycle Association, e-mail to author, 1 February 2001.
16. Ford from Think Mobility, <www.thinkmobility.

- com>, viewed 1 February 2001.
17. Jay Townley, Jay Townley and Associates, untitled newsletter, <www.jaytownley.com/jaytown/html/news2.htm>, viewed 2 February 2001.
 18. "World Market Report," op. cit. note 1, p. 18; population from United Nations, *World Population Prospects, 1998 Update* (New York: 1998).
 19. "Europe Tests Car Bans, Fights Smog and Noise," *Bicycle Retailer and Industry News*, need date.
 20. Lou Mazzante, "Make Marin the Model," *Bicycle Retailer and Industry News*, 1 August 2000; Lou Mazzante, "The Delft Experiment Gives Ideas to Marin Model Planners," *Bicycle Retailer and Industry News*, 1 August 2000.
 21. "Chinese Bike Crash Fatalities Approach 35,000," *Bicycle Retailer and Industry News*, 15 July 2000.
 22. Nate Jackson, "Millions Still Available for Bike Projects," *Bicycle Retailer and Industry News*, 1 August 2000.
 23. Lou Mazzante, "Pedals for Progress Spurs Economic Development," *Bicycle Retailer and Industry News*, 1 December 2000.
 24. Ibid.
 15. Elisabeth Rosenthal, "West's Medicine Is Raising Bills for China's Sick," *New York Times*, 19 November 1998.
 16. Doubling from *Factors Affecting the Growth of Prescription Drug Expenditures* (Washington, DC: National Institute for Health Care Management, July 1999) p. 6; Robert Pear, "Marketing Tied to Increase in Prescription Drug Sales," *New York Times*, 20 September 2000.
 17. IMS Health, op. cit. note 3.
 18. Ibid.
 19. World Health Organization (WHO) figure (for 1997 market) from Shara Rosen, *Vaccine Trends and Developments Worldwide* (New York: Theta Reports, June 1998).
 20. Michael R. Reich, "The Global Drug Gap," *Science*, 17 March 2000.
 21. Joint U.N. Programme on HIV/AIDS, *Patent Situation of HIV/AIDS-Related Drugs in 80 Countries* (Geneva: January 2000).
 22. WHO page on Essential Drugs and Medicines, <www.who.in/medicines/edm-concept.htm>, viewed 3 December 2000.
 23. Reich, op. cit. note 20; WHO, op. cit. note 22; \$2 from Daphne A. Fresle, *Essential Drugs and Medicines Policy*, WHO, Geneva, e-mail to author, 1 December 2000.
 24. Global Alliance for Vaccines and Immunizations, <www.gavi.org>, viewed 3 December 2000.
 25. Reich, op. cit. note 20.
 26. Ibid.
 27. Tina Rosenberg, "Look at Brazil," *New York Times Magazine*, 28 January 2001.
 28. Stephen M. Fried, *Bitter Pills: Inside the Hazardous World of Legal Drugs* (New York: Bantam Books, 1998).
 29. Sheryl Gay Stolberg and Jeff Gerth, "High-Tech Stealth Being Used to Sway Doctor Prescriptions," *New York Times*, 16 November 2000.
 30. Robert Pear, "Marketing Tied to Increase in Prescription Drug Sales," *New York Times*, 20 September 2000.
 31. Sheryl Gay Stolberg, "The Boom in Medications Brings Rise in Fatal Risks," *New York Times*, 3 June 1999.
 32. J. Lazarou et al., "Incidence of Adverse Drug Reactions in Hospitalized Patients: A Meta-analysis of Prospective Studies," *Journal of the American Medical Association*, April 1998, pp. 1200-05.
 33. Jane Brody, "As Prescriptions Pile Up, Risks Do, Too," *New York Times*, 5 September 2000; Fried, op. cit. 28, p. 26.

PHARMACEUTICAL SALES THRIVING (pages 106-07)

1. IMS Health, *Pharmaceutical World Review* (London: various years).
2. Ibid.; most profitable industry from "Fortune 500," *Fortune Magazine*, April 2000.
3. Population Reference Bureau (PRB), "2000 World Population Data Sheet," wall chart (Washington, DC: June 2000); IMS Health, *Pharmaceutical World Review* (London: 2000).
4. PRB, op. cit. note 3; IMS Health, op. cit. note 3.
5. IMS Health, op. cit. note 3.
6. Laurie Garrett, *Betrayal of Trust: The Collapse of Global Public Health* (New York: Hyperion, 2000), pp. 566-68.
7. Ibid.
8. IMS Health, op. cit. note 3.
9. Ibid.
10. Ibid.
11. Ibid.
12. Ibid.
13. Donald G. McNeil Jr., "Selling Cheap 'Generic' Drugs, India's Copycats Irk Industry," *New York Times*, 1 December 2000.
14. Amy Barrett, "Pfizer: How Big is Too Big?" *Business Week*, 28 August 2000, p. 216; health budgets from World Bank, *World Development Indicators 2000* (Washington, DC: 2000), pp. 90-93.

PVC PLASTIC PERVADES ECONOMY (pages 108–09)

1. Figure of 250 million tons based on Wytze van der Naald and Beverly Thorpe, *PVC Plastic: A Looming Waste Crisis* (Amsterdam: Greenpeace International, 1998), p. 5; 100 million tons based on rates from Robert U. Ayres, "The Life Cycle of Chlorine, Part III: Accounting for Final Use," *Journal of Industrial Ecology*, vol. 2, no. 1 (1998), pp. 105–06.
2. Aida M. Jebens, "Polyvinyl Chloride (PVC) Resins," *CEH [Chemical Economics Handbook] Marketing Research Report* (Zurich: SRI International, 1997), pp. 580.1880D–80H.
3. Vinyl Institute, <www.vinylinfo.org/material/vinyl/servingmoretour/4monomertopolymer.html>, viewed 13 June 2000.
4. Chemical Market Associates Inc. (CMAI), "Polyvinyl Chloride," *PVC Insight*, vol. 8, issue 15 (2000), p. 1.
5. Data for 1992 from John F. Auchter, Mario Jaeckel, and Yasuhiko Sakuma, "Polyvinyl Chloride (PVC) Resins," *CEH Marketing Research Report* (Zurich: SRI International, 1993), p. 580.1880D; 1999 from CMAI, op. cit. note 4.
6. Early 1990s from Auchter, Jaeckel, and Sakuma, op. cit. note 5, p. 580.1880E; future rate from "Chemical Market Associates Inc.'s Industry Report," *PVC Insight*, vol. 8, issue 19 (2000), p. 1.
7. Estimate based on "Chemical Market Associates Inc.'s Industry Report," op. cit. note 6.
8. "Production: Gains Beat Losses," *Chemical & Engineering News*, 26 June 2000, p. 55.
9. CMAI, op. cit. note 4.
10. Ibid.
11. Jebens, op. cit. note 2, p. 580.1880G.
12. Shin-Etsu from "Japan, PVC Output Falls 3.5% in May," *PVC Insight*, vol. 8, issue 21 (2000), p. 1; Formosa Plastics from CMAI, op. cit. note 4.
13. "Production: Gains Beat Losses," op. cit. note 8, p. 86.
14. Ibid., pp. 88, 89.
15. Sinopec, "China Struggles to Meet Growing Resin Demand," *PVC Insight*, vol. 8, issue 23 (2000), p. 3.
16. Joe Thornton, *Pandora's Poison: Chlorine, Health, and a New Environmental Strategy* (Cambridge, MA: The MIT Press, 2000), pp. 306–12.
17. U.N. Environment Programme (UNEP), "Governments Finalize Persistent Organic Pollutants Treaty," press release (Johannesburg: 10 December 2000).
18. Principia Partners, "Post-Industrial and Post-Consumer Vinyl Reclaim: Material Flow and Uses in North America," final report to Chlor-Vinyl Steering Group (Exton, PA: Principia Partners, July 1999).
19. Share that is chlorine from Vinyl Institute, op. cit. note 3; UNEP, Chemicals Division, *Dioxin and Furan Inventories: National and Regional Emissions of PCDD/PCDF* (Geneva: Inter-Organization Programme for the Sound Management of Chemicals, May 1999), pp. 13–15.
20. ARGUS et al., *The Behaviour of PVC in Landfill*, Final Report, DGXI.E.3 (Brussels: European Commission, February 2000).
21. Eckhard Plinke et al., *Mechanical Recycling of PVC Wastes*, Study for DG XI of the European Commission (Basel, Switzerland: Prognos Institute, January 2000).
22. Alexander H. Tullo, "Plastics Additives' Steady Evolution," *Chemical & Engineering News*, 4 December 2000, p. 21.
23. Ted Schettler et al., *Generations at Risk: Reproductive Health and the Environment* (Cambridge, MA: The MIT Press, 1999), pp. 181–82.
24. Thornton, op. cit. note 16, p. 313.
25. Stephen D. Pearson and Lawrence A. Trissel, "Leaching of Diethylhexyl Phthalate from Polyvinyl Chloride Containers by Selected Drugs and Formulation Components," *American Journal of Hospital Pharmacology*, July 1993, pp. 1405–09.
26. Schettler et al., op. cit. note 23, pp. 181–82, 335.
27. Benjamin C. Blount et al., "Levels of Seven Urinary Phthalate Metabolites in a Human Reference Population," *Environmental Health Perspectives*, October 2000, pp. 979–82.
28. Jouni J.K. Jaakkola et al., "Interior Surface Materials in the Home and the Development of Bronchial Obstruction in Young Children in Oslo, Norway," *American Journal of Public Health*, February 1999, pp. 188–92.
29. European Commission, Directorate General III, "Ban of Phthalates in Childcare Articles and Toys," press release (Brussels: 10 November 1999).
30. Samer Iskander and Emma Tucker, "France Bans 'Toxic' Toys," *Financial Times*, 8 July 1999.
31. Danish Ministry of Environment and Energy, *Action Plan for Reducing and Phasing Out Phthalates in Soft Plastics* (Copenhagen: June 1999); "Denmark Plans to Cut Phthalates," *Chemical Market Reporter*, 6 July 1999.
32. Greenpeace International, *Chlorine and PVC Restrictions and PVC-Free Policies: A List Compiled by Greenpeace International*, 3rd ed. (Amsterdam:

- August 1999).
33. "By the Numbers: 3-PVC," *Plastics Recycling Update*, March 2000, p. 4.
 34. CHEMinfo Services, Inc., "PVC Products and Markets," in *A Technical & Socio-Economic Comparison of Options, Part 2—Polyvinyl Chloride*, report prepared for Environment Canada (Toronto: November 1997).
 35. Institute for Local Self-Reliance, "Biochemical Substitutions in the Polymer Industry," Pollution Solution Fact Sheet No. 4 (Minneapolis: 1995).
 36. Allison Schelesinger, "Perfecting Planet-Friendly Plastics," *IT: Inventing Tomorrow* (University of Minnesota, Institute of Technology), spring 1999, pp. 30–35.
- MICROCREDIT EXPANDING RAPIDLY**
(pages 110–11)
1. Microcredit Summit, "Empowering Women with Microcredit: 2000 Microcredit Summit Campaign Report," <www.microcreditsummit.org/campaigns/report00.html>, viewed 26 February 2001.
 2. Ibid.
 3. Ibid.
 4. Ibid.
 5. Ibid.
 6. Loans of \$50 from Consultative Group to Assist the Poorest, "About & History," <www.cgap.org/html/mi_about_history.html>, viewed 5 March 2001; 3 billion from World Bank, *World Development Report 2000/2001* (New York: Oxford University Press, 2001), p. 3.
 7. Consultative Group to Assist the Poorest, op. cit. note 6.
 8. Microcredit Summit, "CRECER: Promoting Credit and Education in Bolivia," in *Countdown 2005: The Newsletter of the Microcredit Summit Campaign*, May/June 1999.
 9. Figure of 70 percent from U.N. Development Programme, *Human Development Report 1995* (New York: Oxford University Press, 1995), p. 4.
 10. Grameen Bank, <www.grameen-info.org/bank/cds.html>, viewed 4 March 2001.
 11. Ibid.
 12. Grameen Bank, *Annual Report 1999* (Dhaka, Bangladesh: 2000), p. 39.
 13. Ibid.
 14. Ibid.
 15. Grameen Bank, op. cit. note 10.
 16. FINCA International, *The Case for Village Banking* (Washington, DC: 1997), p. 6.
 17. Ibid.
 18. Jacqueline Bass and Katrena Henderson, "Leasing: A New Option for Microfinance Institutions," *Bamako 2000: Innovations in Microfinance*, Technical Note No. 6, USAID Microenterprise Best Practices Project, <www.mip.org/pubs/MBP/Leasing—A_New_Option.htm>, viewed 5 March 2001.
 19. "FINCA Uganda Launches Pilot Health Program," *Village Bank Notes* (newsletter of FINCA International), fall 2000.
 20. Manohar Sharma, "Impact of Microfinance on Poverty Alleviation: What Does Emerging Evidence Indicate?" in *Rural Financial Policies for Food Security of the Poor*, Policy Brief No. 2 (Washington, DC: International Food Policy Research Institute, March 2000), p. 2.
 21. Ibid.
 22. Freedom from Hunger, *Credit with Education Strategy for Improving Nutrition Security: Impact Evaluation Results from Ghana* (Davis, CA: 1998).
 23. Ibid.
 24. Craig F. Churchill, "Bulletin Highlights," *MicroBanking Bulletin*, September 2000, p. 30.
 25. Ibid.
 26. Consultative Group to Assist the Poorest, "When is Microfinance NOT an Appropriate Tool?" <www.cgap.org/html/mi_faq.html>, viewed 5 March 2001.
 27. Ibid.
 28. Goal for 2005 from David S. Gibbons and Jennifer W. Meehan, CASHPOR Financial and Technical Services, "The Microcredit Summit's Challenge: Working Towards Institutional Financial Self-Sufficiency While Maintaining a Commitment to Serving the Poorest Families," unpublished draft, June 2000, pp. 3–4; 1.2 billion from World Bank, op. cit. note 6.
- STOCK MARKETS FOLLOW A ROCKY ROAD** (pages 112–13)
1. London Stock Exchange from James Trager, *The People's Chronology* (New York: Henry Holt and Co., 1994), p. 270.
 2. "Stocks in Trade," *The Economist*, 13 November 1999, p. 85; trading volume on stock exchanges calculated from data reported by Global Financial Data, <www.globalfindata.com>, viewed 6 December 2000.
 3. Alex Berenson, "Market Paying Price for Valuing New-Economy Hope Over Profits," *New York Times*, 21 December 2000; Alex Berenson, "The

- End of the Party, Or Is It?" *New York Times*, 24 December 2000.
4. William Greider, *One World, Ready Or Not* (New York: Touchstone, 1997), pp. 23, 25; Robert Kuttner, *Everything for Sale: The Virtues and Limits of Markets* (Chicago: University of Chicago Press, 1996), p. 160.
 5. Dean Baker, *The Costs of the Stock Market Bubble* (Washington, DC: Center for Economic and Policy Research, 27 November 2000); Floyd Norris, "During 2000, the Bursting Bubble Did Not Hurt All Stocks," *New York Times*, 29 December 2000.
 6. Robert J. Shiller, *Irrational Exuberance* (Princeton, NJ: Princeton University Press, 2000), p. xii.
 7. International Federation of Stock Exchanges (FIBV), <www.fibv.com>.
 8. Changes since 1980 are calculated in inflation-adjusted U.S. dollar terms. Data on a current-dollar basis from Global Financial Data, op. cit. note 2, and from Morgan Stanley Capital International, <www.msdata.com>.
 9. S&P 500 values and 1980–2000 trend calculation based on inflation-adjusted data computed by Robert J. Shiller, Professor of Economics, Yale University, "Online Data," <www.econ.yale.edu/~shiller/data.htm>, viewed 18 November 2000.
 10. The data are expressed in 1999 dollars; the current dollar figure for 1990 is \$9.4 trillion; 1990 data from World Bank, *World Development Indicators 2000*, CD-ROM (Washington, DC: 2000); 1999 value calculated from FIBV, op. cit. note 7.
 11. Leading-country shares calculated from FIBV, op. cit. note 7; developing-country share calculated from World Bank, op. cit. note 10.
 12. Data in 1999 dollars; current dollar figure for 1990 is \$485 billion; World Bank, op. cit. note 10; FIBV, op. cit. note 7.
 13. Merrill Lynch and Gemini Consulting, *World Wealth Report 2000* (London: 2000).
 14. *Ibid.*
 15. *Ibid.*
 16. The share of U.S. households owning stocks directly or indirectly rose from 32 percent in 1989 to 40 percent in 1995; Chuck Collins, Betsy Leonard-Wright, and Holly Sklar, *Shifting Fortunes: The Perils of the Growing American Wealth Gap* (Boston, MA: United for a Fair Economy, 1999), pp. 12–13.
 17. "Who Has Benefited from Recent Stock Market Gains," *Economic Snapshots* (Economic Policy Institute, Washington, DC), 17 March 1999.
 18. Doug Henwood, "The Boom Years," *The Nation*, 29 March 1999, p. 10.
 19. Edward N. Wolff, *Top Heavy: The Increasing Inequality of Wealth in America and What Can Be Done About It* (New York: The New Press, 1996), pp. 2, 7, 11; idem, *Recent Trends in Wealth Ownership, 1983–1998*, Working Paper No. 300 (Blithewood, NY: Jerome Levy Economics Institute, Bard College, April 2000), Table 2.
 20. Dean Baker, "Economic Reporting Review," 6 March 2000 and 17 July 2000 editions, distributed by the Center for Economic and Policy Research, Washington, DC, <www.cepr.net>; "Profits Soar, Investment Still Lags," *Economic Snapshots* (Economic Policy Institute, Washington, DC), 26 March 1998; Dean Baker, "Too Much Bubbly on Wall Street?" Center for Economic and Policy Research, <www.cepr.net/too_much_bubbly.htm>, viewed 28 December 2000.
 21. The term "irrational exuberance" was used by U.S. Federal Reserve Chairman Alan Greenspan in a speech on 5 December 1996. Robert Shiller discusses a number of underlying factors, including economics, psychology, geopolitics, demographics, and the role of the news media; Shiller, op. cit. note 6.
 22. Calculated in inflation-adjusted terms from data made available online by Global Financial Data, op. cit. note 2, using the Japanese consumer price index as provided by the U.S. Bureau of Labor Statistics, "Consumer Price Indexes, Sixteen Countries, 1950–1999," 7 June 2000.
 23. Shiller, op. cit. note 9.
 24. The ratios reported here were calculated by Robert J. Shiller, Professor of Economics, Yale University. He divided an inflation-adjusted S&P 500 price index by a 10-year moving average of real earnings of companies included in the index, designed to smooth out temporary boosts and slumps in earnings; see Shiller, op. cit. note 9. Other analysts typically use 5-year, 3-year, or 1-year averages to calculate the P-E ratio, but these different methodologies do not change the fundamental picture of an overvalued stock market.
 25. As a rough rule of thumb, every dollar in stock market growth generates about 3–4¢ worth of additional consumption; Baker, op. cit. note 5.
 26. Dean Baker, "After the Fall," *In These Times*, 12 December 1999, pp. 14–15.
 27. "Slowing Down, to What?" *The Economist*, 9 December 2000.

SOCIALLY RESPONSIBLE INVESTING
SURGES (pages 114–15)

1. Figures for 1984 and 1999 based on Social Investment Forum, *1999 Report on Socially Responsible Investing Trends in the United States* (Washington, DC: 4 November 1999), pp. 3, 6; 1995 number based on idem, *1995 Trends Report, After South Africa: The State of Socially Responsible Investing in the United States* (Washington, DC: 1995). These figures are in 1999 dollars, and thus differ from the current dollar sums provided in the Social Investment Forum report. For the 1995 number, portfolios that were both screened and involved shareholder advocacy are included in the screened category. For presentational reasons, Figure 1 excludes community investing, which amounted to \$5.4 billion in 1999.
2. Social Investment Forum, *1999 Report*, op. cit. note 1, p. 5.
3. Based on *ibid.*, p. 3.
4. Social Investment Organization, *Canadian Social Investment Review 2000* (Toronto: December 2000), p. 4.
5. *Ibid.*
6. Current number is an Avanzi estimate cited in *ibid.*, p. 16; number for mid-1980s from Avanzi et al., *Green and Ethical Funds in Europe, 1999* (city unknown: Global Partners for Corporate Responsibility Research, date unknown).
7. Avanzi et al., op. cit. note 6.
8. Number of funds and assets under management supplied by Karen Eldridge, Ethical Investment Research Service, e-mail to Maya Brennan, Worldwatch Institute, 13 March 2001.
9. Avanzi et al., op. cit. note 6.
10. For details of the screens employed by U.S.-based funds, see <www.socialinvest.org/areas/sriguide/mfscdetails.htm>.
11. Social Investment Forum, *1999 Report*, op. cit. note 1, p. 10.
12. *Ibid.*
13. *Ibid.*
14. Alios Flatz, "Looking Forward—Sustainability and SRI," *Environmental Finance*, November 2000, p. 21.
15. Dow Jones Sustainability Group Index, "Dow Jones Indexes and SAM Sustainability Group Launch Sustainability Indexes," press release (Zurich: 8 September 1999); idem, *Key Facts*, <www.sustainability-index.com/description/key_facts.html>, viewed 28 February 2001.
16. "Europe Tops Business Sustainability Index," *Environment News Service*, 20 September 1999.
17. Dow Jones Sustainability Group Index, *Current Licensees*, <www.sustainability-index.com/licenses/current.html>, viewed 28 February 2001.
18. Social Investment Forum, *1999 Report*, op. cit. note 1, p. 15.
19. *Ibid.*; "Forest Stewardship Council Applauds Home Depot Leadership in Forest Conservation," press release (Washington, DC: 30 August 1999).
20. Shareholder Action Network, "IRRC's Review of Shareholder Actions in 2000," <www.shareholderaction.org/victory.cgi?id=2>, viewed 16 February 2001.
21. "Domini 400 Social Index Trails in 2000, Outperforms S & P in 7 of Last 10 Years," KLD & Co. Inc., <www.kld.com/sitenews.cgi?id=7>, viewed 16 February 2001.
22. Danny Hakim, "On Wall Street, More Investors Push Social Goals," *New York Times*, 11 February 2001.

TOLL OF NATURAL DISASTERS GROWS (pages 116–17)

1. Economic losses from Munich Reinsurance Company (Munich Re), *Topics: Annual Review of Natural Catastrophes 1999* (Munich: June 2000).
2. *Ibid.*, p. 19.
3. Munich Re, *Topics 2000: Natural Catastrophes—The Current Position* (Munich: December 1999), p. 14.
4. Seth Dunn, "Weather-Related Losses Hit New High," in Lester R. Brown, Michael Renner, and Brian Halweil, *Vital Signs 1999* (New York: W.W. Norton & Company), pp. 74–75, based on data from Munich Re.
5. Munich Re, op. cit. note 1.
6. Munich Re, op. cit. note 3, pp. 64–65.
7. *Ibid.*
8. *Ibid.*; homeless from Worldwatch analysis of data from the Centre for Research on the Epidemiology of Disasters (CRED), *EM-DAT Database* (Brussels, Belgium), <www.md.ucl.ac.be/cred/emdat/intro.html>, obtained June 2000.
9. Munich Re, op. cit. note 1, p. 24. "Richest countries" are defined as having a per capita annual income greater than \$9,361, while "poorest" are defined as those with less than \$760.
10. Munich Re, op. cit. note 1.
11. *Ibid.*
12. Munich Re, *World Map of Natural Hazards* (Munich: 1998), p. 19.
13. Munich Re, op. cit. note 3, pp. 64–65.
14. *Ibid.*
15. *Ibid.*
16. *Ibid.*

Notes

17. Ibid., p. 123; number affected from Red Cross, *World Disasters Report 2000* (Geneva: 2000).
18. Red Cross, *World Disasters Report 1999* (Geneva: 1999), p. 34.
19. Janet N. Abramovitz, "Averting Unnatural Disasters," in Lester R. Brown et al., *State of the World 2001* (New York: W.W. Norton & Company, 2001), pp. 129–30.
20. Joel E. Cohen et al., "Estimates of Coastal Populations," *Science*, 14 November 1997, p. 1209c.
21. Molly O. Sheehan, "Urban Population Continues to Rise," in Lester R. Brown, Michael Renner, and Brian Halweil, *Vital Signs 2000* (New York: W.W. Norton & Company, 2000), pp. 104–05.
22. U.N. Population Division, *World Urbanization Prospects: The 1999 Revision* (New York: 1999).
23. Red Cross, op. cit. note 18, p. 19.
24. Intergovernmental Panel on Climate Change, *Climate Change 2001: The Scientific Basis, Summary for Policymakers*, <www.ipcc.ch>, viewed 23 January 2001.
25. "Impact of Climate Change to Cost World \$US 300 Billion a Year," press release (Nairobi: U.N. Environment Programme, 2 February 2001).
26. World Bank/U.S. Geological Survey cited in John Twigg, ed., *Developments at Risk: Natural Disasters and the Third World* (Oxford, U.K.: Oxford Centre for Disaster Studies, UK Coordinated Committee for the IDNDR, May 1998).
10. System size from Peter Reina, "Delayed Athens Subway Finally Begins Trial Operation," *Engineering News Record*, 20 December 2000; riders from Douglas Frantz, "Parthenon Next, Watch the Closing Doors," *New York Times*, 19 December 2000.
11. Christine Pirovolakis, "New Subway System to Cut Smog, Reduce Traffic Congestion in Capital," *International Environment Reporter*, 16 February 2000, pp. 169–70.
12. European Commission, *Transport in Figures*, <www.europa.eu.int>, viewed 8 December 2000.
13. American Public Transit Association (APTA), "Transit Ridership Report: Third Quarter 2000," 29 December 2000, <www.apta.com/stats/ridership/index.htm>, viewed 29 January 2001.
14. Craig Savoye, "More Americans Trade Car Keys for Bus Passes," *Christian Science Monitor*, 17 May 2000; Aravind Adiga, "Americans' Love Affair With The Car May Be Starting to Fade," *Financial Times*, 15 August 2000; American Public Transportation Association (APTA), "Public Transportation Ridership Continues to Soar: U.S. Transit Ridership Shows 4.8 Percent Increase in First Quarter," press release (Washington, DC: 17 July 2000); APTA, "Public Transportation Scored Another Record Year in 2000," press release (Washington, DC: 10 January 2001).
15. United Nations, *World Urbanization Prospects: The 1999 Revision*, Key Findings, <www.undp.org/popin/wdtrends/wdtrends.htm>, viewed 20 January 2001.

URBAN RAIL SYSTEMS GATHER STEAM (pages 126–27)

1. Types of urban rail from American Public Transit Association, "Public Transit Definitions," <www.apta.com>, viewed 29 January 2001.
2. Ibid.
3. Tony Pattison, ed., *Jane's Urban Transport Systems 2000–2001* (London: 2000), pp. 20–24.
4. Ibid.
5. Ibid.
6. Jan Scheurer et al., "Can Rail Pay?" Discussion Paper (Perth, Australia: Institute for Sustainability and Technology Policy (ISTP), Murdoch University, undated).
7. Ibid.
8. Seth Mydans, "Bangkok Opens Skytrain, But Will It Ease Car Traffic?" *New York Times*, 6 December 1999.
9. System length and size from Pattison, op. cit. note 3; riders from David Lamb, "A Heavenly Commute Above Bangkok's Crowded Streets," *Los Angeles Times*, 25 February 2000.
16. Estimates of farmland lost to suburban development from American Farmland Trust, *Farming on the Edge* (Washington, DC: March 1997), and from Liu Yinglang, "Legislation to Protect Arable Land," *China Daily*, 15 September 1998.
17. Vehicle contribution to air pollution from U.S. Environmental Protection Agency, *National Pollutant Emissions Trends, 1900–1998* (Research Triangle Park, NC: March 2000), pp. 3–9 to 3–11.
18. International Energy Agency, *CO₂ Emissions from Fuel Combustion* (Paris: Organisation for Economic Co-operation and Development, 1999).
19. Julian Wolinsky, "Light Rail: One Route to Livable Cities," *Railway Age*, July 1999, pp. 47–49.
20. Stacy C. Davis, ed., *Transportation Energy Data Book*, edition 20 (Oak Ridge, TN: Oak Ridge National Laboratory, U.S. Department of Energy, October 2000), p. 2–14.
21. Peter Newman and Jeffrey Kenworthy, *Sustainability and Cities: Overcoming Automobile Dependence* (Washington, DC: Island Press, 1999), pp. 123–24; Jeffrey R. Kenworthy et al., *An Interna-*

- tional Sourcebook of Automobile Dependence in Cities 1960–1990* (Boulder, CO: University Press of Colorado, 1999), pp. 619–20.
22. Jonas Rabinovitch and Josef Leitman, "Urban Planning in Curitiba," *Scientific American*, March 1996, pp. 26–33; Jonas Rabinovitch, "Innovative Land Use and Public Transport Policy," *Land Use Policy*, vol. 13, no. 1 (1996), pp. 51–67.
 23. "World Bank Lending for Transport," <www.worldbank.org/html/fpd/transport/lending.htm>, viewed 7 June 2000. The remaining World Bank transportation lending was split between rural roads (12 percent), multi-modal and sector reform (5 percent), railways and highways (2 percent each), and other projects (1 percent).
 24. Magda Stoczkiewicz, "The Conditions Attached to Western Money," *T&E Bulletin* (newsletter of the European Federation for Transport and Environment, Brussels), May 2000, Special Feature on Central and Eastern Europe, p. 2; idem, CEE Bankwatch Network, Brussels, discussion with author, 2 October 2000.
 25. Kenworthy et al., op. cit. note 21, pp. 547–50.
 26. Ibid.
 27. Ibid.
 28. "Bangkok's Train, Running on Empty," *The Economist*, 23 December 2000, p. 46.

GASOLINE TAXES VARY WIDELY (pages 128–29)

1. "Oil Prices and Taxes in Year 2000: An IEA Statistical Fact Sheet," in International Energy Agency (IEA), *Energy Prices and Taxes: Quarterly Statistics, Second Quarter 2000* (Paris: Organisation for Economic Co-operation and Development (OECD), 2000), p. xiii.
2. U.S. Department of Energy (DOE), Energy Information Administration (EIA), "World Oil Supply, 1996–2000," <www.eia.doe.gov/emeu/ipstr/t22.txt>, viewed 20 January 2001. The members of the Organization of Petroleum-Exporting Countries are Algeria, Indonesia, Iran, Iraq, Kuwait, Libya, Nigeria, Qatar, Saudi Arabia, United Arab Emirates, and Venezuela.
3. DOE, op. cit. note 2.
4. DOE, "World Oil Demand, 1996–2000," <www.eia.doe.gov/emeu/ipstr/t24.txt>.
5. DOE, "Crude Oil Prices by Selected Type, 1970–2000," <www.eia.doe.gov/pub/energy/overview>. Prices in Figure 1, in nominal dollars, are for Saudi Arabian Light-34°API, which is one of several varieties of crude oil.
6. National average prices and taxes from IEA, *Monthly Price Statistics: End-User Oil Product Prices and Average Crude Oil Import Costs, October 2000*, <www.iea.org/statist/index.htm>, viewed 2 December 2000; capital city prices and 32¢ untaxed world average price from Dr. Gerhard Metschies, *GTZ Fuel Price Survey 2000* (Eschborn, Germany: Deutsch Gesellschaft für Technische Zusammenarbeit (GTZ), forthcoming), with preliminary data from idem, GTZ, e-mail to author, 28 December 2000.
7. Crude oil from DOE, op. cit. note 2, and from idem, op. cit. note 4; gasoline from idem, "World Apparent Consumption of Refined Petroleum Products, 1997," <www.eia.doe.gov/emeu/international/petroleu.html>, viewed 20 January 2001.
8. American Petroleum Institute, *How Much We Pay For Gasoline: 1999–April 2000 Review* (Washington, DC: May 2000).
9. Metschies, *GTZ Fuel Price Survey 2000*, op. cit. note 6.
10. Vehicle contribution to air pollution from U.S. Environmental Protection Agency, *National Pollutant Emissions Trends, 1900–1998* (Research Triangle Park, NC: March 2000), pp. 3–9 to 3–11.
11. Vehicle contribution to carbon dioxide in IEA, *CO₂ Emissions from Fuel Combustion* (Paris: OECD, 1999).
12. "India Fuel Price Rise Seen Eroding Cost Margins," *Bridgenews Global Markets*, 30 September 2000.
13. "Vietnam Press: Hanoi Hikes Gasoline, Gas Oil Prices; Drops Oil Taxes," *Bridgenews Global Markets*, 21 September 2000.
14. Sean Yoong, "Malaysians Grow Anxious Over Imminent Gasoline Price Hike," *Associated Press*, 28 September 2000; Patvinder Singh, "Fuel Subsidy Too High," *New Straits Times-Management Times*, 26 September 2000.
15. "Indonesia Fuel Prices Rise 12 Percent; Minor Protests," *Associated Press*, 1 October 2000.
16. Crude oil prices from DOE, EIA, "International Crude Oil Price Data," <www.eia.doe.gov/emeu/international/petroleu.html#CrudePrices>, viewed 20 January 2001; weak European currency from G. Thomas Sims, "Euro-Zone Prices May Heat Up Soon: Higher Energy Costs, Euro's Weakness Could Spur Consumer-Level Inflation," *Wall Street Journal Europe*, 25 October 2000, and from "Euroshambles," *The Economist*, 4 September 2000.
17. Edmund L. Andrews, "Weiskirchen Journal: At \$4 a Gallon, Finding Joy on the Road Not Taken," *New York Times*, 24 March 2000; Douglas Andrew,

- “Wrapup—More Countries Join European Fuel Price Protests,” *Reuters*, 18 September 2000.
18. European Federation for Transport and the Environment, *Fuel Price Protests in the EU: A Commentary* (Brussels, Belgium: September 2000).
19. Netherlands from “Countries Make Concessions to End Protests Over Fuel Costs,” *St. Louis Post-Dispatch*, 17 September 2000; Italy from Andrews, *op. cit.* note 17.
20. Charles Hutzler, “Higher Gas Prices in China Stir Concern,” *Associated Press*, 30 June 2000.
21. “Indonesians Riot Over Fuel Prices,” *Associated Press*, 3 October 2000; “Indonesian Students Release Hostages Held During Fuel Price Protest,” *Bridgenews Global Markets*, 5 October 2000.
22. “Expected Impact of Rising Oil Prices on Asia (Part II),” *Bridgenews Global Markets*, 25 September 2000.
23. Gerhard P. Metschies, *Fuel Prices and Taxation: With Comparative Tables for 160 Countries* (Eschborn, Germany: GTZ, May 1999).