SPRING 2000
ISSUE 139

RESOURCES

RESOURCES FOR THE FUTURE RESEARCH THAT MAKES A DIFFERENCE

Paul R. Portney

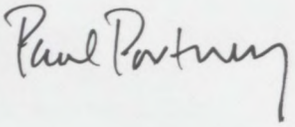
Trade and the Environment

Last month—just days before hundreds of protestors were arrested trying to disrupt the annual meetings of the World Bank and International Monetary Fund—RFF and the Brookings Institution held a media briefing on the topic of world trade, the environment, and labor standards (see coverage on page 20). My colleague Wally Oates and I presented our view that while there are good reasons for concern about environmental quality in developing countries, restricting global trade is exactly the wrong way to tackle the problem. As has happened in the United States, Western Europe and other developed economies, prosperity through expanded trade can be the environment's best friend for the simple reason that as people's incomes grow, their concern for improving the environment rises dramatically.

The feature articles in this issue of *Resources* illustrate how far the United States has come in improving its environment, and provide a glimpse of its rising ambition to do even more. RFF Fellow Jim Boyd writes about the last major hurdle to overcome in cleaning up our nation's waterways. Nearly 30 years after the Clean Water Act was passed, most large industrial and municipal sources of water pollution have been brought into check, and federal officials are now revisiting an ambitious plan to curb contamination that comes from "nonpoint" sources such as road and farm runoff. As Jim writes, this approach will alter the politics and economics of water quality regulation, and if successful, it will have a major impact.

A second feature looks at how changes in environmental quality and our natural resource base might be accounted for differently in the nation's income accounts. The so-called "Green GDP" concept described by Senior Fellow Joel Darmstadter and our newest RFF Board Member, economist Bill Nordhaus, has been controversial in Congress, but it may provide a more informative view of the relationship between environmental and economic progress.

These issues are strikingly different from those that the United States faced as recently as 30 years ago and those that developing countries face today. The western world enjoys an affluence that allows it the luxury to set ambitious environmental goals for itself, and to dedicate substantial resources to meeting them. Our prosperity brings with it an obligation to help other nations improve their standards of living, and to show them that economic progress, fostered in part through expanded trade, does not have to come at the expense of the environment.



Paul Portney

RESOURCES

RESOURCES FOR THE FUTURE
1616 P Street, NW
Washington, DC 20036–1400
202–328–5000

FAX: 202–939–3460
E-MAIL: *info@rff.org*
WORLD WIDE WEB:
http://www.rff.org

RESOURCES
Editor, Felicia Day

Published quarterly since 1959, *Resources* (ISSN 0048-7376) contains news of research and policy analysis regarding natural resources and the environment. The views offered are those of the contributors and should not be attributed to Resources for the Future, its directors, or its officers. Articles may be reproduced, providing credit is given and a copy of the reproduced text is sent to *Resources*.

Resources is sent to individuals and institutions without fee. Write or e-mail *Resources* at RFF; or call 202–328–5000. The publication is also available at the RFF Web site.

Printed on recycled paper with 20% post-consumer content.

PRINTED WITH SOY INK

GOINGS ON

Home Loan Program Designed to Combat Sprawl Could Lead to Higher Default Rate

A new mortgage program designed to combat urban sprawl may actually lead to higher rates of default on home loans, according to a recent analysis by researchers at Resources for the Future. The program, known as the "location-efficient mortgage," promotes home buying close to cities or mass transit by relaxing downpayment requirements for buyers in these areas. Location-efficient mortgages, a component of the Clinton administration's Livable Cities Initiative, are being pilot-tested in Chicago, San Francisco, and other cities through a $100 million initiative spearheaded by Fannie Mae and others.

According to advocates of the program, people who live in densely populated or transit-rich areas incur lower transportation costs, mainly because they own fewer cars and drive their cars less. As a result, the argument goes, they have more disposable income and their downpayment requirements can be relaxed without increasing the risk that they will default.

According to the RFF study, however, the transportation "savings" people may enjoy in these neighborhoods do not translate into lower default risk. RFF Fellow Allen Blackman and Senior Fellow Alan Krupnick examined the incidence of default for 8,000 loans made by the Federal Housing Administration in greater Chicago between 1988 and 1992. They concluded that people in the areas targeted by the loan program are every bit as likely to default as those in other areas, all other factors being equal. This conclusion holds for a number of different measures of location efficiency, including greater housing density, better access to mass transit, more pedestrian "friendliness," and an index of these attributes used by loan providers. The findings do not mean that there are no transportation savings in these areas, the authors say; rather, they simply show that the savings are not sufficiently large to affect the probability of default.

The implication of these findings is that extending higher levels of credit to borrowers in these areas through a large-scale, location-efficient mortgage plan may actually raise default rates, causing increased losses for mortgage institutions. These institutions may need to subsidize these loan programs or modify them to reduce default risk by, for example, requiring borrowers to undergo financial counseling, an idea currently under discussion. The added costs of subsidies would have to be balanced against any benefits the program might bring, such as controlling sprawl.

RFF's research was funded under a cooperative agreement with the U.S. Environmental Protection Agency. The paper, *Location Efficiency and Mortgage Default*, can be downloaded at *www.rff.org/disc_papers/PDF_files/9949rev.pdf*.

Reducing the Service Sector's Environmental Toll May Take New Incentives for Businesses

The service sector, which now accounts for three-quarters of the nation's employment and Gross Domestic Product, has a major influence on environmental quality in the United States, according to a new RFF study led by Terry Davies, director of the Center for Risk Management. As the nation continues to evolve into a post-industrial economy, businesses and regulators should explore ways to improve the environmental practices of firms in the service sector, which can influence the behavior of their suppliers "upstream" and consumers "downstream." The three-part study paints the most complete picture yet of how the health care, foodservice, and tourism industries affect the environment.

Minimizing the environmental impacts of the service sector will require a different regulatory approach from that applied to manufacturing, mining, or agriculture, the study shows. Rather than cranking out new regulations, federal and local officials should instead focus on devising incentives for service businesses to adopt environment-friendly behaviors, ranging from reducing energy use in fast-food chains to educating tourists about protecting sensitive habitats, the reports say. For example:

Health care leaders and government regulators should continue to encourage the use of substitute materials for mercury, for example in dental fillings. At the same time, they should accelerate the transition away from on-site assembly of all medical products using both mercury and radioactive materials in favor of central, off-site locations, where the waste that is generated can be better handled.

The health care industry should also be encouraged to find ways to reduce the current stream of solid medical waste, which has grown in recent years as hospitals have sought to reduce the risk of hospital-acquired infections.

The foodservice and food retail industries should attempt to leverage the behavior of suppliers and consumers by encouraging producers, wholesalers and distributors to reduce packaging, use recycled materials, and reduce pesticide use. Firms also can offer more environment-friendly choices to consumers, thus helping raise consumer awareness.

Businesses and regulators are most likely to reduce the harmful environmen-

tal effects of tourism by launching educational efforts that are tailored for specific audiences and designed to complement existing regulations. For example, officials could combine a prohibition against anchoring a sightseeing boat in a sensitive marine ecosystem with an explanation of the potential damage a boat can do to that ecosystem.

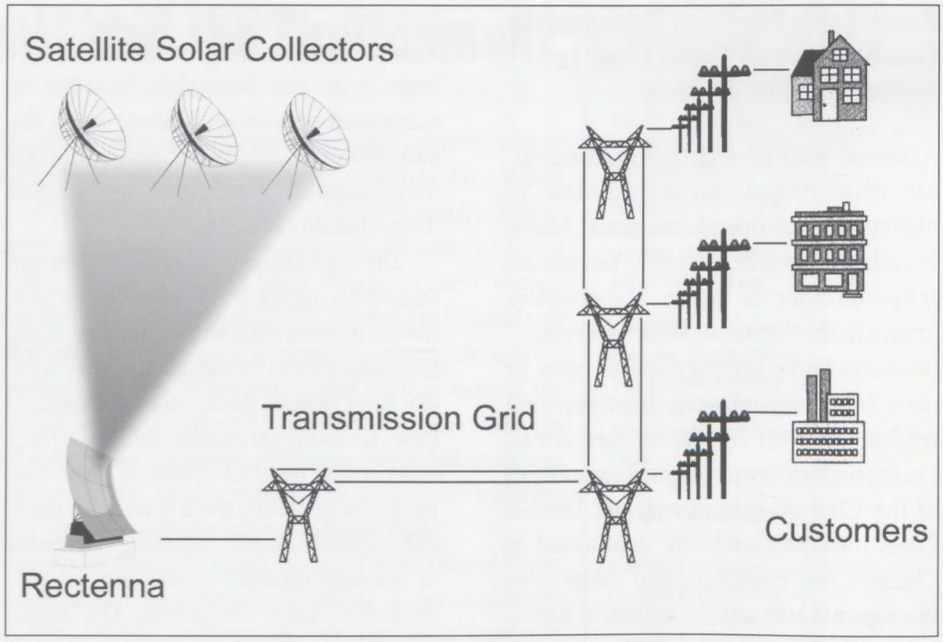
Hotels can offer guests the choice of having their linens cleaned less frequently, and use this as an opportunity to explain the environmental benefits of such a program. Educational approaches also could be targeted at the industry by emphasizing the cost savings and marketing benefits of "green" tourism, the report says.

All three reports—*Environmental Implications of the Tourism Industry, Environmental Implications of the Health Care Service Sector,* and *Environmental Implications of the Foodservice and Food Retail Industries*—can be downloaded at *http://www.rff.org/disc_papers/2000.htm*. The study was funded by the U.S. Environmental Protection Agency.

Plan to Harness Solar Power with Satellites Faces Technical Difficulties

For more than 30 years scientists have wrestled with an intriguing possibility—could orbiting satellites be used to harness solar energy for generating electricity on earth? Advocates have speculated that satellite solar power (SSP) could someday take its place among other renewable energy sources as an alternative to fossil fuels.

A new RFF report concludes that this technology is not likely to become a viable energy source in the next 20 years. The RFF study, led by Senior Fellow Molly Macauley, projects that future demand for satellite solar energy is unlikely to be enough to justify the considerable costs involved in developing it. By 2020, when many experts believe SSP could be technically feasible, conventional electricity generation is likely to be sufficient in terms of cost, supply, and mitigated environmental impacts.



Under the scenario envisioned by SSP proponents, satellites would be launched to gather solar energy and send the energy back to earth, where a receiving antenna on the ground would convert it to a form usable by electric utility grids. The National Aeronautics and Space Administration (NASA) actively pursued this idea for nearly a decade before it halted this work in the early 1980s because of its likely high costs and technical difficulty. The agency recently resurrected the idea, however, after independent reports and a 1997 NASA-sponsored study reached a more favorable conclusion about the potential of satellite solar power to become part of the world's energy portfolio.

Because the technology needed to develop SSP is still in its early stages, it is difficult to assess how much it will ultimately cost to develop, and thus how competitive it may be compared to other forms of energy, the RFF study says. For SSP to be competitive, significant reductions would be needed in the costs of launching the satellites into space and other key technologies.

Additionally, demand for SSP may be low among foreign countries unless they share in control of the system. At the same time, some in the public continue to worry about the possible health effects of electric and magnetic fields, a fact that may further weaken SSP's public support.

The report encourages the federal government to continue developing new technologies that would lower the costs of SSP—particularly focusing on technologies that may be transferable to other projects. Over the course of its study, RFF's economic researchers communicated frequently with NASA's technical engineers.

GOINGS ON

If plans to develop SSP move forward, such collaborations between technical design researchers and those conducting economic and market analyses should continue, the report says, and the energy industry should be invited to participate in these discussions as well.

Given the large uncertainty about demand and costs, it would be premature for the government to make more serious financial commitments to satellite power, such as by guaranteeing loans or providing tax incentives or other financial assistance to private companies to develop it, the report says.

While its economic viability for generating power on earth may be limited, satellite space power may prove useful for powering systems based in space, the International Space Station, other large orbiting platforms, lunar bases, or other activities to explore and develop space. RFF will release a follow-up report this summer that assesses the costs and benefits of these other nonterrestrial applications.

The study, *Can Power from Space Compete: The Future of Electricity Markets and the Competitive Challenge to Satellite Solar Power,* was funded by NASA. It appears on the RFF Web site at *http://www.rff.org.*

Tracking the Cost of Complying with Environmental Regulations

For more than 20 years, the U.S. Census Bureau tracked the cost of complying with environmental regulations through its Pollution Abatement Costs and Expenditures (PACE) survey. Begun in 1972, the PACE survey was suspended in 1995 for budget reasons, but the Census Bureau is planning to reinstate it again this spring.

At the request of the U.S. Environmental Protection Agency (EPA)—a partial funder of the PACE survey—RFF held a workshop in March to explore ways that the survey can be improved. The reappraisal comes at a critical time. Since the survey was first designed in the early 1970s, firms have embarked on increasingly ambitious ways of complying with regulations, the costs of which are typically hard to measure. Workshop participants, who included government officials, academics, and business representatives, discussed a host of issues reflective of this more expansive view toward pollution prevention. Some of the questions that were addressed concerned: which types of abatement actions should be measured, which sectors of the economy should participate in the survey, and whether investments in energy efficiency or other greenhouse gas mitigation should be tracked. Survey design factors—such as how to value abatement costs associated with changes in process or design, and how to improve the quality of the survey responses—were also considered. Insights gained at the workshop will be described in a report to EPA, due to be completed this summer.

Environmental Citizenship to Support Transboundary Pollution Reduction in the Danube

RFF recently began work on a pilot project to develop an institutional framework for providing public access to environmental information and developing public participation procedures in Hungary and Slovenia. RFF's partners in this effort are New York University (NYU) School of Law and the Regional Environmental Center for Central and Eastern Europe (REC). The project is designed to assist international efforts to reduce transboundary pollution from the discharge of nutrients and toxics into the Danube River. It is funded by the Global Environment Facility (GEF), with funds administered by the United Nations Development Programme (UNDP).

RFF, NYU, and the REC will work with officials from the Environment Ministries of Hungary and Slovenia and nongovernmental environmental law organizations from both countries. Hungary and Slovenia are among the "fast-track" countries emerging from 50 years under the Soviet system.

Both countries have made strong, public commitments to developing open government provisions in their administration of environmental protection. However, they are still in the process of developing experience to support these changes. The pilot project will help build capacity in these two countries to establish the legal, institutional, social, and practical infrastructure for public access to environmental information and also for informed, meaningful public participation in protecting the Danube.

In addition to supporting the efforts of Hungarian and Slovenian environmental experts, the project will also demonstrate how open government measures can help other Danube countries to achieve region-wide commitments to improve deteriorating water quality and provide greater public access to environmental information in each of their countries.

GOINGS ON

RFF Scholars Meet with Thai Researchers and Officials to Discuss Public's Role in Environmental Decisionmaking

Three RFF scholars—Ruth Greenspan Bell, Thomas Beierle, and Ramanan Laxminarayan—recently met with Thai researchers and officials to explore the evolving role for citizens in environmental decisionmaking. The setting was a workshop, held March 18–19, in Bangkok, Thailand. The workshop, entitled "Good Governance, Public Participation and the Decision-Making Process for Environmental Protection," was attended by 150 Thai government officials, representatives from nongovernmental organizations and industry, and academics.

The motivation for the workshop was Thailand's 1997 constitution, which expanded the legal rights of citizens to become involved in government decisionmaking. Many of Thailand's environmental procedures are being reexamined to incorporate greater public involvement. The Thai government has not yet decided how possible new practices will be institutionalized in government agencies. Workshop participants were particularly interested in the role of public hearings in the overall environmental impact assessment process, especially in light of ongoing controversy in Thailand over large-scale industrial and natural resource projects.

Bell, director of the RFF program on International Institutional Development and Environmental Assistance, outlined the U.S. perspective on public participation and explained the role of the courts and the public in environmental impact assessment under the United States' National Environmental Policy Act. Beierle and Laximinaryan described the "lessons learned" from case studies of public participation in controversial environmental decisions in the United States, Canada, and India. In turn, the Thai researchers described public participation in Thailand from the point of view of the country's unique legal, political, and cultural context. At the conclusion of the workshop, RFF researchers and their Thai colleagues began formulating ideas for continued collaborative research.

The workshop was jointly sponsored by RFF and the Institute for Social and Economic Policy (ISEP), an independent research organization in Bangkok. RFF's partner in organizing the workshop was ISEP's Suthawan Sathirathai, who has worked previously with RFF researchers David Simpson and Roger Sedjo. Additional support for the workshops came from the United States-Asia Environmental Partnership, the Canadian International Development Agency, and the Thailand Research Fund.

Workshop speakers included: Dr. Vanchai Vatanasapt, Khon Kaen University, Prof. Dr. Tongroj Onchan, Thailand Environment Institute, and RFF's Ruth Greenspan Bell and Ramanan Laxminarayan

Unleashing the Clean Water Act

The Promise and Challenge of the TMDL Approach to Water Quality

Jim Boyd

Nowhere are the promise and challenge of holistic policymaking better illustrated than in changing approaches to water quality regulation. The U.S. Environmental Protection Agency will soon issue final rules that will invigorate the largely dormant Total Maximum Daily Load provisions of the Clean Water Act. Over the next two decades, these rules will put into motion significant, state-led changes in the regulation of pollutant sources.

The environmental movement's greatest intellectual triumph is the now-common understanding that environmental conditions are the end-product of complex interactions between a variety of physical, biological, and social systems. Environmental policy itself is growing toward a more holistic, and complex, approach to the diagnosis and resolution of environmental problems; however, this growth will not come without difficulty.

Nowhere are the promise and challenge of holistic policymaking better illustrated than in changing approaches to water quality regulation. Last August, the U.S. Environmental Protection Agency (EPA) proposed new rules to invigorate the largely dormant Total Maximum Daily Load (TMDL) provisions of the Clean Water Act (CWA). The final rule, due this summer, will have immediate implications for water quality monitoring and analysis.

Over the next two decades, the rules will put in motion significant, state-led changes in the regulation of pollutant sources. Instead of the technology-based, end-of-pipe approach to controlling point sources that has characterized water quality enforcement to date, the TMDL program promises an "ambient" approach to water monitoring and standards. Rather than focus on releases from known sources of pollution, regulations will increasingly address the overall quality of waterbodies. In a nutshell, the TMDL approach is to monitor lake, river, and estuarine water quality; identify the nature and location of polluted waters; trace pollutants to their sources; and impose controls adequate to guarantee the health of various waterbodies.

Implicit in the TMDL approach is a focus on the causes and effects of pollution throughout a watershed. More explicitly, the TMDL program will seek the identification of any and all sources of pollution. It also will focus on what we all ultimately care about the most—the cleanliness of our waterbodies. It all sounds sensible and straightforward, but in fact it is a radical, untried departure from current practice.

CWA regulation over the last 25 years has yielded significant water quality improvements. Nevertheless, the current approach is somewhat limited due to its focus on point sources, the most easily identifiable and recti-

JIM BOYD

CHESAPEAKE BAY FOUNDATION

fiable pollution sources. Point sources are typically large factories or municipal sewage treatment plants. The fact that they were responsible for a significant fraction of water quality problems in the past and were easy to identify justified this narrow approach. But the low-hanging fruit of low-cost, high-volume point source controls has been harvested. Today, significant water quality improvement requires the expansion of controls to nonpoint sources.

While industrial and municipal point sources will no doubt continue to be vivid symbols of the nation's water pollution problems, this image is increasingly inappropriate. Water pollution from agricultural, commercial, and urban sources—called nonpoint pollution—while harder to caricature, should be the focus of our dissatisfaction. Hundreds of thousands of river miles and millions of lake acres remain impaired on account of it. Because nonpoint sources are a primary cause of those impairments, TMDLs will change the politics, economics, and implementation of water quality regulation. Along the way, water quality will increasingly be seen as interdependent with other spheres of concern, notably air quality and land use programs. Moreover, the tools required to understand the fate of pollutants, assign responsibility, and monitor compliance within watersheds will tax regulators' technical and financial resources. Such is the price of holistic policymaking.

The Nonpoint Source Challenge

Water quality improvements over the last 25 years have resulted primarily from point source controls. Future improvements must come principally from nonpoint source controls. Today, agricultural runoff, in the form of pesticides, fertilizer, and animal wastes, is the single largest contributor to the impairment of rivers and lakes. Logging and construction activities, many of them on federal lands, are a significant source of sediment contamination, as runoff carries fine-grained soils from roads and construction sites into lakes and streams.

In urban and suburban areas, watershed degradation is closely tied to increased population density and residential and commercial development. In such areas, the relatively impermeable nature of the groundcover leads to rapid, unfiltered runoff to rivers, lakes and oceans from roadways and parking lots, chemically treated lawns, and commercial establishments. Increased attention is also being given to atmospheric deposition, where pollutants from airborne dust and industrial and commercial air emissions are absorbed by surface waters or precipitated via rainfall.

One of the reasons why nonpoint sources are such a significant problem is that they present serious implementation, monitoring, and enforcement challenges. Nevertheless, the water quality problems they cause can no longer be ignored. In this context, it is not surprising that political and legal pressures are being applied to the EPA, and in turn to the states, to make something of the regulatory potential contained in the CWA's TMDL provisions.

The Changing Politics of Water Quality

The seeds of this shift in regulatory emphasis have been in place since the CWA's passage in 1972. The act contains provisions that call for enforcement to be driven by ambient water quality rather than end-of-pipe controls and for states to identify waters for which the point source controls elsewhere in the act "are not stringent enough to implement any water quality standard applicable to such waters." States must prioritize any waters so identified, based on analysis of use and severity of degradation, and establish total maximum daily pollutant loads sufficient to bring the waters into compliance.

During the first two decades of CWA enforcement, the states as well as the federal government largely ignored the TMDL provisions. But the failure of most states to attain water quality goals and the federal government's desire to bring more sources into the regulated sphere has led to a reexamination of latent enforcement power in the CWA. The TMDL provisions are important because they require statewide assessments and public documentation of water quality problems, and they appear, at least in principle, to imply that states must allocate pollutant load reductions to sources not currently covered by load restrictions.

Since the bulk of current impairment is caused by nonpoint sources, any state seeking further load reductions (at least on a cost-benefit basis) will be led directly to nonpoint sources. In this way, the shift to ambient monitoring and standards almost necessarily leads to a greater emphasis on nonpoint sources.

EPA's authority to implement the new TMDL rules is being challenged by a variety of agricultural interests on the grounds that authorizing legislation is required, given ambiguities in the CWA. The agency's opponents argue that the CWA covers only waters impaired by point sources, thus leaving EPA without authority to promulgate such rules. The agency contends that the CWA provides it with ample authority to step in and issue nonpoint controls if there is evidence of ongoing impairments and inadequate state responses to them. These issues must be resolved in the coming years. The scope of federal authority will be challenged, as will state efforts to assign responsibility for load reductions under their own statutes. (In fact, the legal scrum is already well underway. A recent RFF report, "The New Face of the Clean Water Act: A Critical Review of the EPA's Proposed TMDL Rules," explores these issues in more detail.) But despite bumps in the road, movement toward a system of regulation that addresses nonpoint sources and that views water quality as a watershedwide issue is inevitable.

Any enforcement of the CWA's TMDL provisions will alter the politics of load reduction. The need to meet *in situ* water quality standards sets up a state-by-state confrontation between well-organized industrial interests (which can claim to have already paid their pollution control dues) and organized agricultural, commercial forestry, and municipal interests who resist the "expansion" of CWA-driven requirements to their hard-to-solve nonpoint problems. Absent nonpoint controls, point sources can reasonably expect to be held responsible for load reductions on TMDL-impaired waterbodies. This scenario is obviously of great concern to current point source permit holders.

Technical Hurdles Posed by Watershed-Level Regulation

A striking feature of this political and legislative history is that we have been down this road before. Statutory approaches that predate the CWA, such as the Water Quality Act of 1965, also called for ambient water quality standards and state-driven implementation plans (two fundamental features of the TMDL approach). The failure of these earlier approaches to water quality regulation is a cautionary tale. Water quality-driven standards and controls present a variety of daunting challenges. Looking to the future, these challenges loom large.

The first step in the TMDL process is the listing of a waterbody as impaired. Impairment is established in reference to criteria set by the states; the criteria describe the standards, data to be used, and relevant guidelines necessary to ensure the quality of data analysis. These monitoring, classification, and notification requirements are the first administrative and technical challenge for states. While this is the least taxing of the exercises set in motion by the TMDL process, it is worth noting that many states have had difficulty in meeting even these preliminary requirements.

With knowledge of impairments, states must put forward defensible plans for source reductions to bring the affected waterbody into attainment. This kind of exercise is fraught with technical difficulties. Analysis of loadings and the effect of load reductions requires some form of watershedwide modeling that captures transport processes (such as infiltration and runoff), groundwater and surface water interactions, pollutant accumulation and decay, and in-stream mixing. In the case of nonpoint source loads, the science is relatively undeveloped due to the complexity of the interacting systems involved. Knowledge of the relationship between control practices and loadings is particularly poor.

Because of the wide range of pollutant sources, pathways, and factors that affect loadings, source contributions will rarely if ever be known with certainty. Instead, the regulator must rely on models that attempt to capture the factors that affect the transport, deposition, and ultimate fate of pollutants in the waterbody. Models will also be required to predict how changes in land use brought on by economic growth will add to future loadings.

The modeling techniques and data required for TMDL implementation will contribute significantly to the costs of implementation. Some simplicity and cost savings will undoubtedly be possible as states become more practiced in TMDL development (and as more resources are devoted to the development of data and models for use in this kind of program.) However, the degree to which data sources and modeling techniques can be standardized is limited. Each listed water segment is, in some sense, unique because of its hydrology, transport pathways, pollutant sources, and so forth. TMDL development will invariably involve site-specific analysis.

A lack of scientific certainty will not by itself legally hobble

TMDL plans, since certainty is not a prerequisite for program implementation. Uncertainty does place a premium, however, on administrative procedures that provide the greatest possible level of scientific credibility to standards, models, and data collection. Pollutant sources, unhappy with their designation, will undoubtedly seek relief from TMDL controls by challenging a state's modeling tools, water quality criteria, and data collection procedures. Accordingly, the technical details of state TMDL programs should be subject to ongoing notice and comment procedures and evaluation by expert panels. This is likely to be a source of both significant up-front and long-run program costs. Credibility, transparency, and enforceability are particularly paramount if flexible environmental controls, such as effluent trading, are to be realistically contemplated.

The Scope of Interactions

The TMDL program's ambitions are all the more notable when their interactions with other areas of environmental law and regulation are considered. Consider the potential impact of TMDLs on air quality regulation. Air deposition is a major source of water pollution; a prime example is nitrogen oxides deposition to the Chesapeake Bay. Air deposition links water quality in one state with air emissions in another. While the implications of this linkage have not been fully contemplated, it does create the distinct possibility of jurisdictional conflict both across state borders and within EPA program offices. (See *Resources* 137, "A Dilemma Downwind" for more on the inter-jurisdictional implications of clean air policy.)

In addition, the TMDL rules will increasingly highlight the artificial distinction between water quality and quantity issues, particularly in the West. Water quantity decisions, which are controlled primarily by state law, often have a direct impact on water quality: changes in stream flow affect the transport of pollutants; the amount of water taken or returned to a waterbody may significantly affect the dilution of pollutants; and water supply often determines the suitability of a waterbody as habitat for fish or other species. Because of these interactions, water quantity decisions (relating to irrigation, damming, reservoir management, basin-to-basin trades, and the like) may affect a water's TMDL status. Accordingly, TMDLs will in some cases constrain water transfers involving impaired waterbodies.

Despite the challenges it presents, the TMDL approach clearly demonstrates movement toward a welcome, mature phase of water quality regulation. The key feature of EPA's proposed TMDL rules is that they are motivated by, and address, water quality issues created by the widest range of sources. The holistic, watershed-level analysis required by the TMDL process will inevitably identify a larger sphere of often-unregulated discharge sources. For these reasons alone, the TMDL program is likely to promote significant, desirable changes in the implementation of water quality regulation.

Jim Boyd is a fellow in RFF's Energy and Natural Resources Division.

Greening the GDP

Is It Desirable? Is It Feasible?

Joel Darmstadter

Eight years ago, the Bureau of Economic Analysis (BEA) of the U.S. Department of Commerce started exploring the issues involved in adjusting the Gross Domestic Product (GDP) to include activities associated with the environment and natural resources. Congress subsequently suspended BEA's work, pending an independent review by the National Research Council's (NRC) Committee on National Statistics. That process is now complete and the committee's findings are presented in a new book, *Nature's Numbers: Expanding the National Economic Accounts to Include the Environment.*

RFF Senior Fellow Joel Darmstadter offers his assessment of the committee's work and the broader historical issues associated with measuring the impact of environmental and natural resource activities. Separately, Yale economist William Nordhaus, who chaired the NRC Committee on National Statistics, discusses the report's implications.

In recent years, environmental activists, as well as a number of mainstream economists, have voiced dismay about the limitations of the gross domestic product (GDP) and related social-accounting aggregates as reliable measures of national economic performance and thereby as a legitimate basis for important policy decisions. This criticism has focused in particular on the extent to which measured GDP fails to reflect two important phenomena: the depletion of natural resources as well as damage to the ambient environment.

Why, critics ask, do we make allowances in our national accounts for the depreciation of structures and industrial equipment but not for the depletion of petroleum lifted from reservoirs? Why include damage to and losses from physical capital but not for the deterioration of an urban airshed? Hence, the call for an adjusted, "green" GDP—or more precisely, NNP (net national product)—that would rectify these measurement weaknesses. It is worth noting, however, that, being primarily a measure of the country's output of marketed goods and services, GDP has long been recognized to have certain—virtually unavoidable—flaws. GDP is no guarantor of human happiness or, by itself, an entirely reliable key to human welfare. For example, the fact that two countries with comparable levels of per capita GDP can have strikingly different degrees of inequality raises profound

A Terminological Clarification

The issue of incorporating green accounts in the nation's national-income-and-product accounts (NIPA) can be clarified by reference to a few basic relationships. More than 60 years ago, Prof. John Hicks, who later won the Nobel prize in economics, pointed out that a rising level of gross national product (GNP) (the difference between GNP and GDP need not detain us here) does not ensure that new investment in a country's private and public infrastructure compensates for the depreciation of such physical capital. In other words, GNP or GDP could continue growing (at least for a while) even while the physical capital, on which future prosperity depended, was wearing out. Hence, a precondition for at least maintaining prevailing levels of economic activity was constancy in the value of net national product (NNP), which equals gross output minus depreciation or, as NIPA labels it, "capital consumption allowances."

Critics of conventional NIPA measurement practices recognize the constant NNP condition as a necessary, but insufficient, basis for sustained levels of economic activity, since it fails to account for changes in the stock of environmental and natural resource assets. It is at this point where the seemingly dry question of NIPA measurement conventions links up with the deeper, more emotionally charged issue of society's prospects for a sustainable future.

ethical issues regarding human well-being. It is also the case that certain nonmarket activities, such as household work by family members or crops grown and consumed on farms, understate national output. (Attempts to "impute" market values to some of these activities have progressed both here and abroad.) And when persons voluntarily opt for leisure in preference to paid work, they most likely enjoy increased welfare while contributing to diminished market output.

The economics profession has hardly shrugged off such vexing conceptual and measurement problems. A landmark 1973 paper by Yale economists William Nordhaus and James Tobin sought to compare recorded output with a range of indicators designed to capture trends reflecting assumed changes in human welfare. Their preferred measure of economic welfare (MEW) per capita showed a long-term growth rate markedly below that of per capita NNP. At the same time, they observed that "progress indicated by conventional national accounts is not just a myth that evaporates when a welfare-oriented measure is substituted." And that judgement, I believe, remains valid today; one cannot lightly dismiss the extent to which existing national account aggregates, with all their defects, correlate well with a number of important indicators reflecting quality of life.

In spite of this long-standing awareness of such measurement issues, and attempts to grapple with them here and internationally, it is fair to say that the somewhat unique dilemma posed by use of natural resources and environmental "services" is of much more recent origin—at least with respect to quantification. The most ambitious effort to address these issues was a proposed multiyear initiative by the U.S. Department of Commerce's Bureau of Economic Analysis (BEA), which was launched with an initial, highly tentative set of findings (limited to selected mineral commodities) issued in 1994.

For reasons that have never been made entirely clear, this effort became politically unwelcome in Congress, which quickly enjoined BEA from pursuing its long-range plan, pending an independent assessment of the possibilities and problems associated with such social accounting reforms. (See Joy E. Hecht, "Environmental Accounting: Where Are We Now, Where Are We Heading," *Resources* 135, Spring 1999.) A distinguished NRC panel, chaired by Nordhaus and entrusted with that assessment task, has now produced the result of its deliberations, *Nature's Numbers: Expanding the National Economic Accounts to Include the Environment* (National Academy of Sciences Press, 1999).

How significant is the NRC report as an analysis of, and brief for, a green GDP and related improvements in the nation's national-income-and-product account (NIPA) system? (See the box on this page for a description of basic GDP terminology.) In my judgment, the volume deserves to be viewed as an outstanding contribution to this complex subject, one that should give combatants in this frequently passionate debate pause for some thoughtful reflection.

While evaluation of BEA's accounting explorations constitutes a significant part of the panel's report, *Nature's Numbers* also provides an up-to-date review of both the conceptual underpinnings of resource and environmental accounts as well as the methodological and empirical challenges in their estimation.

The three principal elements of environmental and resource

accounts are nonrenewable assets, renewables, and environmental quality. Of these, it is the first whose estimation would appear to be the most tractable and whose exclusion from conventional accounting systems is least logical and excusable. After all, numerous activities involving subsoil mineral assets are already reflected in market transactions. For example, revenues from crude oil production, and investment in and depreciation of tangible physical assets, like drilling rigs and gathering lines, are part of the existing account structure. Why not, therefore, include the depletion of (or accretion to) the oil in the ground, the availability of which may be vital to sustaining the economic well-being of future generations?

Challenge of Choosing Appropriate Tools

As the NRC report observes, however, valuing changes in subsoil assets presents formidable challenges, even though it is a lot less complicated than the diminution of national wealth attributable to, say, the value of impaired visibility due to power-plant emissions. The major problem relates to the array of choices regarding the appropriate price to apply to the additions to, subtractions from, or revaluation of resources in the ground. Another challenge has to do with the choice of quantities by which such prices are multiplied. After all, while there may be a consensus as to the 10- or 20-year "on-the-shelf" inventory of proved oil or gas reserves, there may be much disagreement and uncertainty as to the extent of resources beyond proved reserves and the technological conditions under which assets shift from one to the other category.

No wonder that when it comes to green accounting, ranges of possible values—rather than the point estimates one finds in the conventional GDP accounts—are an inherent necessity in resource and environmental accounts. Thus, the report takes note of BEA's estimate of the value of subsoil mineral additions in 1987; these vary between 0.4% and 1.4% of that year's GDP.

Undoubtedly, the range of estimates designed to measure the value of changes in environmental quality would be wider still. Again, in the case of reduced visibility, measurement techniques that attempt to express such change in terms of imputed market values—for example, by using contingent valuation, hedonic pricing, and travel-cost methodologies—are now much more robust than several decades ago. They are far from universally accepted, however, and surely warrant emphatic caveats as one contemplates incorporating the estimates in the standard NIPA system. (See the box on this page regarding GDP treatment of pollution control expenditures.) Moreover, there is bound to be an irreducible set of negative environmental and social impacts that, while clearly adverse to social welfare, is not amenable to the dollar metric used to measure economic activity.

To the NRC committee, these problems are neither surprising nor a reason to throw in the towel on further development of resource and environmental accounting systems. On the contrary, the panel appears wholeheartedly to support the benefits to society of efforts to gauge the extent—however approximate—to which conventionally measured GDP is either a serviceable or misleading proxy of overall economic and environmental health.

Pollution Control Expenditures and GDP

A tangential issue in the green accounting debate has to do with those environmental control or improvement expenditures, such as utility scrubbers, that do enter the GDP accounts, and constitute about 2% of the GDP. It is legitimate to question whether or not such investments adequately offset the value of the damage they are meant to avert. To the extent that they do not, conventionally measured net national product (NNP) would exceed a "true" estimate, provided one can ascribe a marketlike equivalent to such damage. Some people may judge such damage to be beyond quantitative reckoning, believing their welfare to have been "incalculably" diminished. But as pointed out earlier in this essay, GDP, whether conventionally measured or subject to a green adjustment, cannot purport to reflect all aspects of changes in human welfare.

A largely irrelevant issue that sometimes arises in discussions of GDP and its shortcomings is a challenge to the inclusion of items like pollution-abatement spending in the first place. The challenge rests on the contention that, like other so-called "defensive" expenditures, such as dental checkups and oil changes, it does not add to material well-being but merely keeps it from getting worse. If some ombudsman of people's utility functions could establish the boundary between defensive and nondefensive outlays, perhaps this conundrum could be resolved. But don't hold your breath!

At the same time, the NRC committee made clear its view that this more rounded picture should take the form of periodic "satellite" accounts rather than being commingled with the GDP accounts, as presently calculated. Especially for shorter-term policy guidance, the existing GDP account structure must remain the system of choice. Perhaps in time, some components of resource and environmental accounts can be so integrated, just as—following a period of lengthy analysis and vetting—price indices have been modified to reflect emerging trends and new insights into technological change and new product development. But even under the best of circumstances, it is unrealistic to suppose that the existing annual time-series measures of economic performance can ever be augmented to track resource and environmental trends with the same frequency. The NRC committee states its views quite unambiguously:

"[E]xtending the [NIPA accounts] to include assets and production activities associated with natural resources and the environment is an important goal. Environmental and natural resource accounts would provide useful data on resource trends and help governments, businesses, and individuals better plan their economic activities and investments. The rationale for augmented accounts is solidly grounded in mainstream economic analysis ...[however,] environmental accounts must not come at the expense of maintaining and improving the current core national accounts, which are a precious national asset."

Perhaps the best way to encapsulate the value of the NRC study is to say that, for some time to come, the conceptual and philosophical aspects of accounting reforms have been firmly laid down and are not likely to be significantly enhanced by further scholarly discourse. The direction should now shift toward quantification (where feasible) and to Congress, that body's charge for an even-handed exploration of the difficult issues at hand having been conscientiously and admirably met.

Joel Darmstadter is a senior fellow in RFF's Energy and Natural Resources Division. **He thanks Winston Harrington for helpful comments on an earlier version of this article.**

Future Directions for Environmental and Augmented National Accounts

William D. Nordhaus

The national income and product accounts (NIPA) are the most important measures of overall economic activity for a nation. Nevertheless, there have been ongoing concerns that the accounts are incomplete and misleading because they omit nonmarket activity such as unpaid work, the value of leisure time, and most investment in human capital. Most recently, attention has focused on extending the accounts to include natural resources and the environment.

Intensive work on environmental accounting began in the Bureau of Economic Analysis (BEA) of the U.S. Department of Commerce in 1992. BEA published the first official U. S. environmental accounts, known as the Integrated Environmental and Economic Satellite Accounts, in 1994. Shortly thereafter, for reasons that were never clear, Congress directed the Commerce Department to suspend further work in this area and to obtain an external review of environmental accounting. A National Research Council committee was charged with examining the objectivity and application of integrated environmental and economic accounting. That report, *Nature's Numbers*, was published last summer by the National Academy of Sciences.

Over the last quarter century, we have become increasingly aware of the interactions between human societies and the natural environment in which they thrive and upon which they depend. Scholars at Resources for the Future and other organizations have made great contributions to our understanding about resource scarcity, local and national environmental degradation, and global environmental issues.

The combination of increased awareness of the environment and recognition of the primitive state of much of the nation's environmental data has led to a widespread desire to supplement U.S. national economic accounts to include the services of natural resources and the environment. The idea of including environmental assets and services in the national economic accounts is part of a larger movement to develop broader social and environmental indicators. This movement reflects the reality that economic and social welfare does not stop at the market's border, but extends to many nonmarket activities.

The traditional national accounts primarily include the final output of marketed goods and services—namely, goods and services that are bought and sold in market transactions. Notwithstanding the importance of the traditional accounts, it has long been recognized that limiting them to market transactions distorts the accounts as a measure of economic activity and well-being. There is a vast and rapidly evolving array of near-market goods and services—ones that are similar to marketed goods but that are omitted from traditional accounts. This boundary distorts our measures of economic activity. Services provided by nannies are reckoned as part of the gross domestic product, while the services of mommies and daddies are not; the value of swimming in a commercial swimming pool is captured by GDP, while the value of swimming in the Atlantic Ocean is not.

Augmented national economic accounts are designed to provide better measures of genuine national output—what consumers currently enjoy in the way of goods and services, and the accumulation of capital, of all kinds, which will permit the future production of goods and services. Although many different approaches have been taken, the guiding principle in augmented economic accounts is to measure as much of economic activity as is feasible, regardless of whether it takes place inside or outside the marketplace.

Extending the accounts is not just an academic exercise. Better natural-resource and environmental accounts can provide valuable information on the interaction between the environment and the economy, help determine whether the nation is using its stocks of natural resources and environmental assets in an unsustainable manner, and provide data on the implications of different regulations, taxes, and consumption patterns. We seek better measures for scorekeeping (to devise better measures of national saving and investment or broader measures of economic well-being. But the data in augmented accounts are also useful for resource management) to help the nation better manage its subsoil assets, public lands, and precious environmental heritage.

After a thorough review, the NRC committee urged the adoption of an ambitious program for developing a comprehensive set of near-market and nonmarket accounts. In addition to developing environmental and natural resource accounts, significant extensions would include the value of: home production and unpaid work, research and development capital, nonmarket time of the population, and informal and home education. In a wealthy country like the United States, providing information on the structure and interactions of the economy and the environment is an essential function of government. It deserves a serious research effort by the federal government and private research organizations.

William D. Nordhaus is the A. Whitney Griswold Professor of Economics at Yale University, New Haven, Conn. He recently chaired a National Research Council Panel that produced the report *Nature's Numbers: Expanding the National Economic Accounts to Include the Environment* (National Academy of Sciences Press, 1999).

The Surge in Oil Prices

Anatomy of a Non-Crisis

J. W. Anderson

This winter's price hike, which came less than a year after oil dropped to its lowest price in a generation, underscores the inherent unpredictability of the world's oil market. But the price increase came nowhere close to threatening the American economy. Unlike previous hikes, which were triggered by dramatic political or military events, this year's run-up was prompted by the most basic of economic forces—a mismatch of supply and demand.

Crude oil prices tripled over the past year. Gasoline, at the high point in late March, was up 68% to $1.53 a gallon for regular grade. In February, in New England, home-heating oil was briefly more than double the price from the year before.

But by mid-spring the market was declining again. Spot prices for crude oil had fallen sharply in the six weeks following the peak, and the average price of gasoline was down five cents a gallon. These drastic swings in price invite questions about the underlying causes and the public policy response—if any—that might be warranted.

Last winter was the fourth time in 30 years that oil prices had suddenly, without warning, shot upward. The sudden price spike was caused by two miscalculations by OPEC, the Organization of Petroleum Exporting Countries. OPEC expanded production just as East Asia was going into a recession; however, OPEC and most observers underestimated its severity. That produced a glut of oil, which forced prices down, in early 1999, to a lower level, adjusted for inflation, than they had been for a generation. Then, to correct that glut, OPEC cut production in late 1999 just as East Asia was coming out of the recession much faster than expected. With demand rising and production falling, prices shot up.

The point is not that Saudi Arabia, the dominant force in OPEC, should have been smarter. The point is that a lot of genuinely unpredictable things happen in the world, and the markets for commodities like oil are inherently unstable.

The three previous oil shocks were related to great military and political events: the Arab-Israeli War of 1973, the Iranian Revolution of 1979, and the Iraqi attack on Kuwait in 1990. The recent experience demonstrates that this kind of shock can also occur in peaceful times, in the absence of any unusual political tension.

In the oil markets, elasticities—at least in the short term—are low. Relatively small imbalances in volume can result in very large price movements. In the last three months of 1999 and the first three months of 2000, demand for crude oil was greater than supply by perhaps 2.5 million barrels a day (mbd) (the shortfall was filled by drawing down stocks). This shortfall, 3.4% of world oil production, was sufficient to propel the price of crude from $9 a barrel in early 1999 to more than $30 a barrel in February 2000.

The chronology of this episode begins in fall 1997. World demand had been rising rapidly, and OPEC expected that rise to continue. It had been coming from two regions, North America and East Asia, reflecting the long economic boom in both. The planners did not fully comprehend the force of the financial crisis that had begun in July with Thailand's drastic devaluation. But the crisis in Thailand led to similar currency troubles in several other countries. Because oil is priced in dollars, the devaluations had the immediate effect of hugely increasing the cost of oil in Asian economies that had accounted for a large part of the increase in world consumption.

Factors that Influenced the Oil Glut

While misjudgment of the East Asian financial crisis was the primary cause of the glut in 1998–99, there were other factors that aggravated it. They were all coincidental, but they all pushed in the same direction. (Lawrence Goldstein, president of the Petroleum Industry Research Foundation, Inc., has made this point, among other places, in his paper *Market Factors Not Price "Dumping," an Analysis of the 1998 Oil Price Collapse,* August 1999.) One contributor was the weather. The winter of 1997–98 was unusually warm in North America, Europe, and Japan. Another was Russia's financial distress—the country had defaulted on some of its debt in August 1998, leading to a sharp depreciation of the ruble. That both depressed internal demand for fuel and greatly increased the incentive to sell Russian oil abroad.

And then there was Iraq. Upon its defeat in the Gulf War of 1991, the United Nations (UN) Security Council placed Iraq under sanctions that cut off its exports of oil. As social conditions in the country deteriorated, the UN began negotiating a procedure under which the Iraqis could sell limited amounts of oil to pay for necessary imports. These limits were progressively expanded as the UN tried to defend itself against charges that the sanctions were causing great suffering among Iraq's people and particularly its children. One consequence was to add to the oversupply on world markets. Because the limits were set in dollars, they permitted increasing amounts of oil to be sold as the market fell.

Although OPEC agreed in December 1997 to increase production, within weeks it realized that it had miscalculated. But the cartel does not make decisions easily or quickly; it suffers many internal divisions, and discipline has always been intermittent. After prices declined through the winter, the cartel met again in March 1998 to announce a substantial cut in production. Several members—Saudi Arabia, Kuwait, and Venezuela—dropped their production a little. But others—Iraq and Iran—raised theirs, and OPEC's total output was unchanged.

In June, the cartel tried again. It announced another large cut, and there was a stronger response by its members. But the price continued to sag. Finally, in March 1999, with the price bouncing around $10 a barrel, the cartel agreed again to cut. Desperation stiffened the member governments' resolution and this time production fell substantially. With that, the market at last began to tighten.

Incidentally, it is useful to note that while OPEC's three announcements of production cuts in 1998-99 add up to 4.3 mbd, the actual cuts came to about 1.6 mbd. The relationship between the announcements and reality is a loose one at best.

During 1999, the East Asian economies began growing strongly again and their oil demand was up. By the end of the year, the price had more than doubled to over $20 a barrel—higher, but still in what the world regards as the normal range. The rapidly rising momentum of the oil market, clear in retrospect, was not obvious at the time. In particular there was great uncertainty about oil stocks. The production statistics of the previous two years implied that someone must be holding huge oil stocks, but whether they actually existed was an open question. It was clear that some traders were holding unusually large stocks against the possibility of Y2K disruptions in the market at the turn of the year. The upward movement of prices was not continuous. Prices actually dropped for a couple of weeks in October. In view of all these conflicting signals, OPEC decided at its December 1999 meeting to make no change in production.

By February of this year, the price was over $30 a barrel and vehement protests were arising from consumers, particularly those in the United States where a presidential election campaign was under way.

Iraq had significantly reinforced the price run-up in the late autumn. Quarrelling with the UN Security Council over the terms of the semiannual extension of the oil-for-food regime, Iraq shut down exports entirely for a couple of weeks in late November and early December. In December, the Security Council revised the sanctions and dropped the limits on oil sales altogether. Iraqi export volumes since then have been erratic, varying hugely from week to week. It is unclear whether this performance is due to technical constraints on production, or to politics—that is, a deliberate tactic of disrupting the market to force a loosening of the sanctions.

The International Energy Agency recently concluded, "The answer is probably midway between the two explanations. The technical problems are real. But politics have led the Iraqis to be less willing to risk permanent reservoir damage than they were last year, particularly when they perceive that the time is right (high prices and tight supply) to try to exert pressure."

Among OPEC's 11 member governments, there is no enduring consensus about pricing policy. In general the countries with large populations and urgent requirements for development financing tend to favor the highest possible prices now. But the countries with large reserves and small populations—above all, Saudi Arabia and Kuwait—take a longer view and try to manage prices to maximize total return over a period of decades. That means holding prices down in a range that most consumers will regard as reasonable, so that they will continue to rely on oil rather than turning to other fuels, and so that non-OPEC producers will not be given incentives to develop high-cost oil sources to compete with OPEC.

In the absence of unusual emotional circumstances like those generated by the 1973 Arab-Israeli War, the Saudi-Kuwaiti pricing strategy usually prevails. When it became clear last winter that prices had indeed moved above the reasonable range, OPEC, led by the Saudis, did not delay. The cartel did not try to hold prices high through the winter to scoop up additional billions of revenue in the high-demand season, instead moving to reassure its customers that prices would come down. And prices did start to fall several weeks before OPEC's announcement March 28 that it would increase production.

What to Do About High Oil Prices?

As prices rose over the winter, many political leaders called for action by the federal government to protect consumers. But experience in the earlier oil shocks strongly indicates that intervention in the market can cost far more than it saves. Price controls in the 1970s caused disruptive shortages and long lines of frantic motorists at filling stations in 1974 and 1979.

Recessions accompanied the first three oil shocks, and for a time it seemed evident that the shocks had caused them. But careful analysis has demonstrated the opposite. The danger of macroeconomic disruption has diminished over the years, as the consumption of oil in relation to the size of the whole economy has fallen. The impact of oil price changes on the rest of the economy is significantly less now than in, say, the 1970s.

In the 1970s, the unprecedented leap in oil prices caused widespread public panic and hoarding that made the disruptions far worse, while in the 1990 case, the public reaction was much more moderate. Over the past winter, there has been grumbling and irritation with oil and gasoline prices, but none of the fear that met the first oil shocks. According to the automobile manufacturers, the high prices have hardly affected the sales of low-mileage models like sports utility vehicles. Gasoline consumption is still rising, although not as rapidly as in the recent past.

There is one circumstance in which a sudden rise in oil prices can create serious social distress, and that is among low-income families who depend on oil to heat their homes. Congress recognized this need long ago and has made Low-Income Home Energy Assistance Program (LIHEAP) grants available through the states. In the past winter, the highest prices were in New England because of distribution difficulties peculiar to the region. Most of the New England States also have assistance programs of their own to supplement the LIHEAP grants.

Except for this special case, the arguments for government intervention in the oil market are not persuasive, in the range of prices predicted and experienced last winter. At one point, when gasoline was at its peak nationwide average of $1.53 a gallon for regular grade, there was talk of its going up to $2 a gallon. Even at that level, the policy errors of the 1970s suggest that intervention in the market would bring little benefit to consumers and potential harm to the economy.

Some leaders in Congress have called for cutting the gasoline tax by 4.3 cents a gallon (the total federal tax is 18.4 cents a gallon). That proposal has run into opposition because the tax funds road construction, and 4.3 cents a gallon raises $5.5 billion a year. Another reason for opposing a reduction in the gasoline tax is that any short-term benefit to American consumers could soon be redirected to producers, as the higher demand led to higher prices.

Surely, there is a point at which rising oil prices could threaten the economy, but prices this past winter came nowhere near it. The high prices of the past winter were an annoyance for most consumers and a hardship for some. But for the country as a whole they never constituted a real economic crisis, and they are now declining.

Where Are We Headed Now?

At a contentious meeting in late March, OPEC decided to raise its production quotas 1.7 mbd. That announcement does not

appear to be a firm commitment, but rather a signal that the exporting countries acknowledge their customers' complaints and intend to respond. The formal statements were followed by explanations that the organization's president would have the authority to request countries to make adjustments as necessary to hold prices in the agreed range. It is the price, not the volume, which guides policy, and no one knows exactly what volume will produce a given price—that's what the argument in the OPEC meeting was about.

One OPEC oil minister, an Algerian, described the desired price range as $22 to $28 a barrel. Another minister, a Saudi, somewhat more precisely spoke of $20 to $25 for North Sea Brent crude. By April 19, the spot price for Brent crude was $22.54, down from $30.05 six weeks earlier. Crude oil futures for May delivery were down $5 a barrel from a high of $32.57, and the futures market showed a steady decline to less than $20 a barrel by the end of 2002. The unexpectedly rapid drop in prices during April was a reminder that just as a rising price is an incentive to hoard, a falling price is an incentive to dump. The effect is to reinforce the volatility of the market.

American gasoline prices usually rise during the summer, when consumption is high. In April the EIA forecast a price by September of about $1.39 a gallon for regular grade, although meeting the projected demand for gasoline this summer without further price surges would require running American refineries at close to full capacity. The rising environmental requirements for gasoline used in this country make it more difficult than in the past to depend on imports to meet seasonal surges in demand. The trend in gasoline consumption in this country over the past decade has been a rise of about 1.5% a year, but that accelerated significantly in the late 1990s. The effect has been to put unexpected pressure on the refining industry. In this situation accidents or other outages could send gasoline prices upward, even while the underlying crude oil price remains steady.

No long-term trend in oil prices exists. Since 1973 prices have fluctuated wildly but without any sustained direction. Even at $30 a barrel, oil was slightly less expensive than the average, adjusted for inflation into today's dollars, over the past quarter of a century. (The peak, in today's dollars, for crude oil was $67 a barrel in 1980, and for gasoline, $2.57 a gallon in 1981.)

The only really reliable prediction is that the oil markets are very difficult to stabilize, and from time to time there will be surprises. Consumers are not defenseless in dealing with an unstable market. Many of them can go elsewhere. Industrial consumers have often responded over the years by switching to natural gas. A generation ago American electric utilities depended heavily on oil. They have now all but eliminated it, partly for environmental reasons but also to avoid price bumps that they have difficulty passing on to their customers. Other large consumers have taken out insurance by buying futures. Most residential customers have also switched to gas.

The most sensible course now appears to be no change in present policy, which means holding the Strategic Petroleum Reserve for dire emergencies, not for tweaking minor changes in the market. It also means encouraging improvements in the fuel economy of the country, both for heating and for transportation; supporting research on alternative fuels, to provide consumers with choices; and reminding consumers not to count on stable prices of oil products. From time to time, unexpectedly, the world's oil market will swing the price dramatically up or down for reasons that are not apparent until after it happens.

J.W. Anderson is RFF's Journalist in Residence. The author wishes to acknowledge the many useful comments provided by Joel Darmstadter, senior fellow, Resources for the Future.

INSIDE RFF

RFF and Brookings Scholars Assess Protesters' Claims about World Bank/IMF Environmental, Labor Policies

At an April 12 press briefing, scholars from RFF and the Brookings Institution offered a candid assessment of the charges being raised by the protesters who attempted to shut down the spring meetings held April 16–17 by the World Bank and the International Monetary Fund (IMF).

RFF President Paul Portney and RFF University Fellow Wallace Oates joined Brookings Vice President Robert Litan and Brookings Senior Fellow Gary Burtless in endorsing the protesters' fundamental goals —protecting the environment and safeguarding workers in developing countries—while criticizing their lack of perspective about how expanded free trade can address these issues. The panelists also commented on alternative approaches for solving environmental and social problems in developing countries and possible reasons why the international monetary organizations have become the target of so much political furor.

"Emotions run very high on these issues but they are extremely difficult to disentangle intellectually," said panel moderator Zanny Minton-Beddoes, Washington economics correspondent for *The Economist*. "Does free trade improve living standards or does it begin a race to the bottom? What's the role of voluntary standards? How do you deal with cross-border environmental issues, such as global warming?"

According to Oates, while there can be troubling, short-term conflicts between environmental goals and trade objectives, it is critically important to see the relationship between trade and the environment over the long haul. The body of available evidence clearly shows that environmental quality is systematically higher in richer countries, he said. For example, there is a very strong correlation between access to safe drinking water and levels of income. "This should come as little suprise," Oates said. "People care about their environment and, as their incomes rise, want to devote a larger share of their resources to protection of the environment."

SYLVIA JOHNSON PHOTOGRAPHY

Zanny Minton-Beddoes and RFF's Paul Portney and Wallace Oates

According to Oates, environmental problems caused by international free trade tend to be very particular in nature and require targeted solutions, such as technical assistance supported by financial aid. Restricting trade tends to be a self-defeating measure, he said; unilateral setting of tariffs or import bans often have little effect on the behavior of polluting industries abroad.

Portney argued that trade, particularly in the form of foreign direct investment in developing countries, can also have a powerful, short-term benefit. The record clearly shows that when firms based in the United States or OECD (Organisation for Economic Co-operation and Development) countries invest in developing countries, they build plants that are akin to those they would build in their home countries, he said. This in turn puts pressure on indigenous firms to lift their environmental standards up to the levels both for occupational safety and health and environmental protection in the developed world, he said.

"In a world in which we want to encourage rather than discourage international trade, there are other mechanisms for harnessing the marketplace to solve environmental and health and safety problems that need to be explored," Portney said. These include increased use of product labeling, greater support for multilateral environmental agreements, elimination of harmful commodity subsidies, direct financial assistance to developing countries to allow them to invest in cleaner technologies; and development of an alternative forum for discussing international environmental practices outside the World Trade Organization (WTO).

Defining Appropriate Worker Protection

Many protesters want to see the World Bank, the IMF, and the WTO refrain from

INSIDE RFF

entering into agreements with countries that lack certain fundamental worker protection provisions, such as prohibitions on child labor. According to Brookings' Burtless, certain minimum protections are acceptable as conditions for loans, or for participation in international credit agreements. But it is important, he said, to keep two cautions in mind.

First, although many advocates of tougher standards really do have the interests of workers in the developing world in mind, Burtless said, others are primarily interested in defending the interests of much better-off workers, namely those in rich countries. "Insisting that your trade partner have just as strong worker protections as you do can easily turn into a standard trade protection," he said. Second, worker protections designed in Paris, London, or Washington "might not be the ones that are terribly appropriate" to people living in certain developing countries, where half or more of the population lives on $2 a day or less, he said.

Brookings' Litan contended that many of the protesters, who professed "to be worried about people abroad, are also worried about themselves." There is as much worker anxiety today about losing one's job, in a world with 4% unemployment, as there was during the 1991 recession, when unemployment was double that, he said. The booming, Internet-driven economy has sparked a rapid increase in productivity growth but there is a corresponding downside—more goods can be produced by fewer people, which has led to downsizing and increased job turn, he said.

The average citizen doesn't see the benefits of expanded free trade, which is perceived as a game played by the *Fortune 500* companies, Litan said. "The more we continue [to] rely on corporate America ... to lead the free trade movement, [the more] it will play right into the hands of the people in the street who are saying it's all one big conspiracy to bring down the fate of the world."

Raymond Kopp Named RFF Vice President for Programs

SYLVIA JOHNSON PHOTOGRAPHY

Raymond J. Kopp

Raymond J. Kopp, a senior fellow in the Quality of the Environment Division, has been named RFF's Vice President for Programs, the institution's senior research position. He has conducted research at RFF since 1977 on a host of environmental and natural resource issues, including climate policy, the benefits and costs of regulations, and how people value the preservation of pristine wilderness areas. He holds a Ph.D. in economics and has published widely in the economic literature.

Ray also serves as executive editor of *Weathervane* (*www.weathervane.rff.org*), RFF's Web site on climate policy, and is a member of the U.S. State Department's Advisory Committee on International Economic Policy. He was the director of RFF's Quality of the Environment Division from 1988 to 1998, and served as director of strategic planning for the past two years.

"Ray's strengths are his keen intellect and his firm commitment to elevating the quality of policy debate through careful research. These will be valuable assets as we expand our research programs in technology, biodiversity, urban development, and the environmental and resource problems of the developing world," RFF President Paul Portney said.

Richard Morgenstern Joins RFF as Senior Fellow

DON BAKER PHOTOGRAPHY GROUP

Richard Morgenstern

Richard (Dick) Morgenstern, an influential figure in international climate policy, has joined RFF as a senior fellow in the Quality of the Environment Division. Most recently, he was senior economic counselor to the Under Secretary for Global Affairs at the U.S. State Department, where he was a member of the U.S. negotiating team for the Kyoto Protocol. Dick served at the U.S. Environmental Protection Agency for more than a decade. While at EPA he acted as Deputy Administrator (1993) and Assistant Administrator for Policy, Planning, and Evaluation (1991–93). He led the Agency's study on multimedia environmental risks, *Unfinished Business*.

His recent domestic research has focused on the accuracy with which the costs of environmental protection are measured, and on the use of economic incentives to reduce greenhouse gas emissions. He has written widely on these issues in both academic and popular journals. His book, *Economic Analyses at EPA: Assessing Regulatory Impact*, was published by RFF in 1997, while he was a visiting scholar.

"Dick's extensive experience—both as a researcher and a policymaker—will be a valuable addition to RFF," Portney said.

INSIDE RFF

Two New Board Members

RFF welcomes two new members to its board of directors, Enron Chairman and CEO **Kenneth L. Lay** and distinguished Yale economist **William D. Nordhaus**.

HEINZ KUGLER PHOTOGRAPHY

Kenneth L. Lay

Lay joined Enron in 1986, following the merger of Houston Natural Gas and InterNorth Inc. in 1985. He joined Houston Natural Gas in 1984, as chairman and chief executive officer. Previously, he served as president and chief operating officer of Transco Energy Co., from 1981 to 1984. Before that, he was president of Continental Resources Co. and executive vice president of its parent company, the Continental Group.

Lay holds a Ph.D. in economics from the University of Houston, and master's and bachelor's degrees in economics from the University of Missouri. He has served as an officer in the U.S. Navy, technical assistant to a member of the Federal Energy Regulatory Commission, and as a Deputy Under Secretary of the U.S. Department of the Interior.

Currently, Lay is a member of the board of directors of Compaq Computer Corp., Eli Lilly and Co., and Trust Co. of the West. He also serves on the board of trustees of the H. John Heinz III Center for Science, Economics, and the Environment; the Business Council; and the National Petroleum Council. Among other honors, Lay was named one of the 25 top managers by *Business Week* for 1996 and 1999.

William D. Nordhaus

Nordhaus is the A. Whitney Griswold Professor of Economics at Yale University. He joined the Yale faculty in 1967 and has been a full professor of economics since 1973. He received his undergraduate degree from Yale and his Ph.D. in economics from the Massachusetts Institute of Technology in 1967.

Nordhaus was a member of the President's Council of Economic Advisers from 1977 to 1979. He has held senior leadership positions at Yale, serving as Provost from 1986 to 1988, and as Vice President for Finance and Administration from 1992 to 1993. Currently, he is a member of and senior advisor to the Brookings Institution's Panel on Economic Activity.

Co-author of the classic textbook, *Economics*, with Paul Samuelson, Nordhaus has written several other books, including *Invention, Growth and Welfare, Is Growth Obsolete?*, *The Efficient Use of Energy Resources*, *Reforming Federal Regulation*, and *Managing the Global Commons*.

Nordhaus's research has focused on economic growth and natural resources, as well as the question of the extent to which resources constrain economic growth. He also has conducted studies in wage and price behavior, augmented national accounting, the political business cycle, productivity, and the costs and benefits of regulation. Recently, his work has focused on the economics of global warming, including the construction of integrated economic and scientific models to determine an efficient path for coping with climate change.

Welcome to the RFF Council

RFF would like to thank the following corporate Council members for their generous support of our efforts to inform and influence environmental policy.

Al Collins
Director of Health, Environment and Safety
Occidental Petroleum Corporation

Martin Durbin
Associate Director, Federal and International Affairs
American Plastics Council

Katherine Fish
Director of Public Policy
Monsanto Company

Michael McAdams
General Manager, Government Affairs
BP Amoco

Susan Sischke
Senior Vice President, Regulatory Affairs and Passenger Car Operations
DaimlerChrysler Corporation

Recent Grants to RFF

The Energy Foundation
$125,000 to study the distribution effects of various domestic greenhouse gas control policies

Cummins Engine Company, Inc.
$15,000 to support general operations and research

DEVELOPMENT

Challenges of Urban Sprawl Call for Unbiased Research, RFF Council Concludes

Urban sprawl has become one of voters' top concerns, according to national opinion polls, but even defining it remains a difficult challenge. Low-density development, strip-mall aesthetics, long traffic jams and diminished wildlife habitat are all related to sprawl. But do these conditions describe the disease, or are they merely the symptoms of a larger problem?

Given the lack of certainty surrounding these kinds of issues, researchers have a key role to play in helping shape policies that can guide future growth policies, members of the RFF Council concluded at the group's annual spring meeting April 13–14 in Miami Beach, Fla.

Members of the Council met with researchers, policy advocates, urban planning officials, private landowners and others in an attempt to understand the problems of sprawl, and to help RFF craft a future research agenda that can point the way to sensible urban growth policies.

Hooper Brooks, program director for the environment, Surdna Foundation

RFF assembled panels that described recent trends in three key areas—land use and urban development, conservation and habitat protection, and transportation and congestion. After discussing these issues in depth, Council members broke into small groups to identify key research questions that emerged.

In the area of land use, for example, they concluded that more information is needed on the long-term economic benefits of brownfield redevelopment. Standardized, high-quality methods for measuring these benefits could help spur redevelopment of contaminated sites.

At the same time, developers need a clear understanding of what the public wants in cities and towns, and in particular whether people truly desire more pedestrian-centered areas, as many advocates believe. If this is the case, researchers should examine the forces that have kept developers from vigorously embracing this type of development.

Council members also said that researchers should identify economic incentives that can encourage the acquisition of key wildlife habitats. Biologists and economists should help officials determine what makes a good land acquisition and advise them on how to effectively direct their limited conservation budgets.

Research in the area of transportation and congestion should focus on the relative contributions that various forms of transportation—such as commercial traffic and commuter trips—have on overall traffic patterns. Also, researchers should develop new ways to measure the success of transportation projects to answer the timeless question of whether new or improved roads encourage new development or vice versa, and should encourage regional decisionmaking on transportation issues, some Council members said.

Jo Cooper, president, Alliance of Automobile Munufacturers

Perhaps nowhere are the challenges facing local officials more acute than in Southeast Florida, where the meeting took place. Already one of the country's fastest-growing metropolitan areas, the population of Southeast Florida is expected to swell by more than two million new residents by 2015. Growth pressures centered in the suburbs to the west of Miami are placing unprecedented pressure on the delicate Everglades ecosystem, and municipal leaders are grappling with how to accommodate growth while simultaneously attending to the environmental needs of the area. After the meeting, Council members were guided by Miami officials on a tour of what they believe are some of the city's successes and failures in urban development, including areas of unchecked development, redeveloped brownfields sites, and restored historic areas.

RESOURCES FOR THE FUTURE
1616 P Street, NW
Washington, DC 20036-1400

Non-profit
US Postage Paid
Permit No. 1228
Merrifield, VA

ADDRESS CORRECTION REQUESTED