
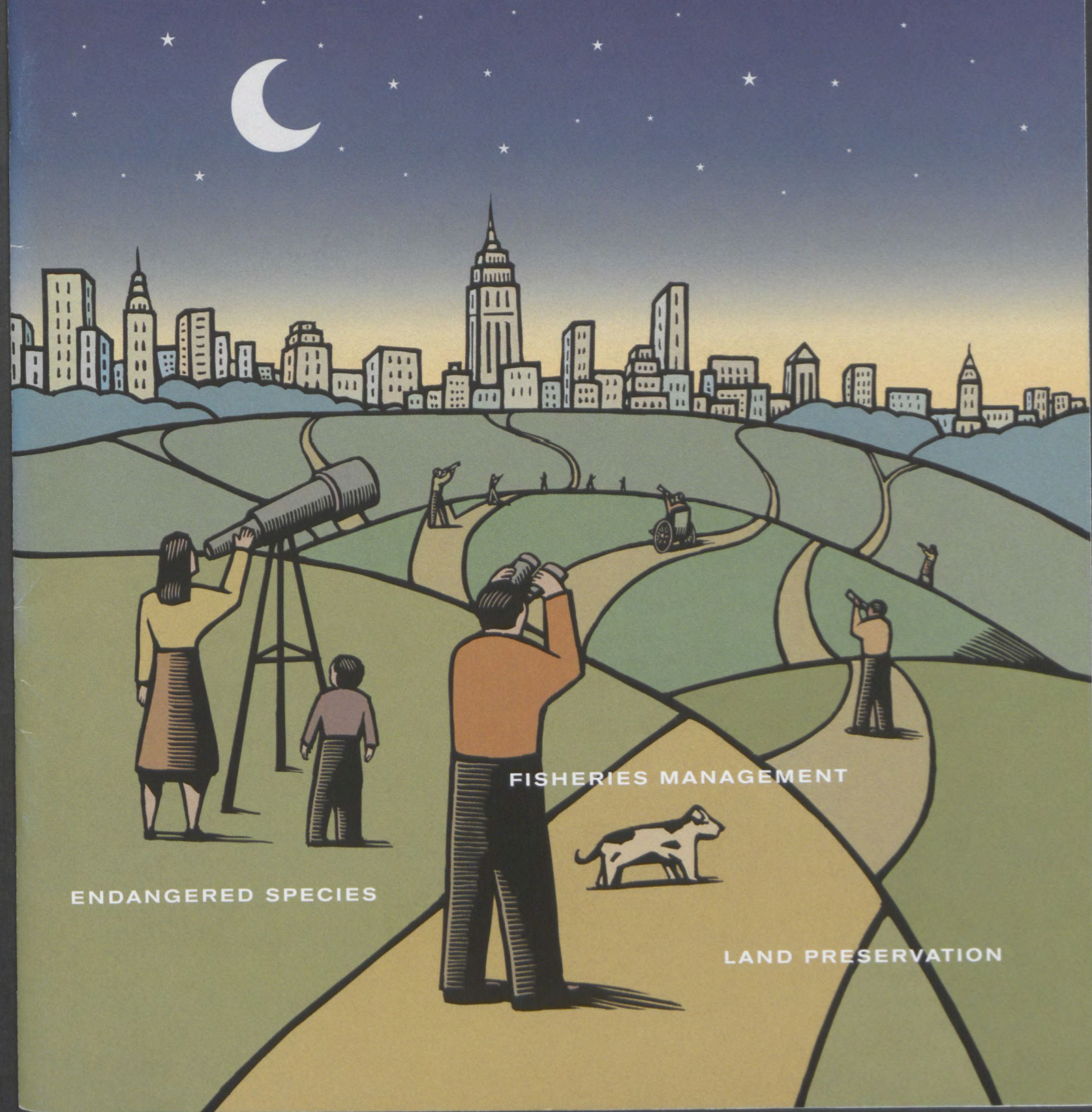


# RESOURCES

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FISHERIES MANAGEMENT

ENDANGERED SPECIES

LAND PRESERVATION



## RESOURCES FOR THE FUTURE

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PAUL R. PORTNEY

## Five Easy Pieces Toward Oil Security

As we had all hoped, the war in Iraq has wound down quickly. We can only hope that a lasting peace is as easily won. One consequence of this very short war is that crude oil (and therefore gasoline) prices have already begun falling as of this writing. If this continues and prompts the country once again to shunt energy policy to the back burner, an opportunity will have been lost. The House of Representatives passed an energy bill in mid-April and the Senate version has now gone to the full floor for debate. But if their respective efforts in the previous Congress are any guide to the future, it is hard to be optimistic that anything meaningful will result.

Space does not permit me here to even casually speculate about the dimensions of an overall national energy strategy—that is, one that addresses not only oil, but also natural gas, electricity transmission and distribution, nuclear power, and hydropower and other renewables. But let me take a crack at suggesting at least the major elements of such a plan.

First, it behooves the United States to encourage the development of new oil production around the world, whether in Africa, Russia and other parts of the former Soviet Union, or elsewhere. The United States currently imports about 55% of the oil it consumes, but even if we imported no oil at all, we would not be immune from fluctuations in the price of oil, whatever their cause. This is because the price of oil is set in world markets and domestic producers will charge that going price even if they could produce all the oil we consume. We need more oil production from whatever sources.

Second, we need a *reasoned* debate about measures to expand oil production here at home. If the Arctic National Wildlife Refuge is to be off-limits for production, as seems likely to be the case, where are the places in the lower 48 states we ought to explore? If we elect not to allow more exploration and production on the Outer Continental Shelf off the coasts of Florida and California (again, a seemingly settled issue, at least for the moment), are there measures that could expand production from existing plat-

forms in the Gulf of Mexico and elsewhere? It's not a sin to ask these questions, even in polite company.

Third, we need to come to some kind of agreement about how we'll go about improving the fuel economy of passenger cars and light-duty trucks, which account for 40% of the oil used in this country. The most cost-effective way to dampen gasoline demand is through higher federal excise taxes on gasoline, but we'll need to look at other measures—such as tighter and redesigned new-car fuel economy standards—if (and only if) the tax approach is deemed politically impossible.

Fourth, we need to invest in basic research pertinent to new technologies for vehicle propulsion. The Bush administration's hydrogen initiative is a good one, though it could be beefed up and modified to include support for any and all technologies—including diesel engines—that hold the promise of delivering clean and affordable mobility in the 21<sup>st</sup> century.

Fifth and finally, the United States is still in need of a coherent strategy for use of the 600 million barrels of oil in the Strategic Petroleum Reserve. Presumably, we have such a reserve because of concern about the adverse macroeconomic effects of a sudden run-up in oil prices. Yet time after time, we endure such increases—whether due to political instability in the Middle East or refinery shutdowns in our own Midwest—without releasing oil to refiners. It's time to set firm rules about when and how the reserve will be used.

You see a faith in (carefully watched) markets in my recommendations about a domestic oil policy. In other articles in this issue, my colleagues show how similar approaches might work to conserve fish stocks, preserve open space, and even protect endangered species. Enjoy! ■

*Paul Portney*

## Senator Lieberman Gives Energy Policy Speech at RFF

John Anderson

Sen. Joseph Lieberman, speaking at the RFF Policy Leadership Forum on May 7, outlined his goals for cutting both the country's oil imports and its emissions of greenhouse gases.

His goal, he said, is to "reduce our dependence on foreign oil by nearly two-thirds within 10 years." That, he declared, would "put us on the path to the day when we won't have to use one drop of foreign oil."

Sen. Lieberman, a Democrat from Connecticut, is a candidate for his party's nomination to the presidency. He argued that his plan would reconcile energy security and economic growth with greater protection for the environment.

Legislation he has co-authored with Sen. John McCain (R-AZ) would

impose a mandatory reduction, he noted, on the amounts of carbon dioxide and other greenhouse gases emitted into the atmosphere by American vehicles, industries, commerce, and homes. These gases are widely thought to be the principal cause of global warming. The Clinton administration helped negotiate a worldwide treaty, the Kyoto Protocol, which would have imposed emissions limits on all the industrialized countries. President Bush rejected the treaty two years ago on grounds that it was too costly and didn't include significant participation by developing countries and, instead, has adopted a program relying on voluntary cooperation by industry to slow down the rising trend in American emissions.



Sen. Joseph Lieberman (D-CT)

Lieberman did not endorse the Kyoto Protocol, pointing out that the emissions limits in the McCain-Lieberman bill are less drastic than those in Kyoto.

"The important point is we're going to rejoin the world," he said. He called for an end to quibbling about the science, which, in his view, is not in doubt, and getting to work as other governments are doing in response to a threat to the stability of the world's climate.

To reduce American oil imports, the senator said, he would set car and truck fuel-efficiency standards at

RFF Fellow Richard Newell.

A capacity crowd came to hear Sen. Lieberman speak and there was a lively question-and-answer session afterward

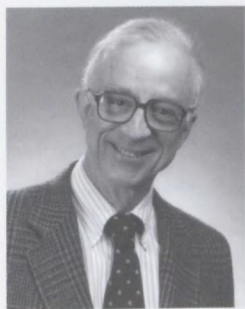


whatever level is needed to save 2 million barrels a day, nearly one-fifth of current highway consumption. He would require electric utilities to generate 20% of their power from renewable sources like wind and solar energy. And he would subsidize new technologies, particularly in the use of coal. Hydrogen can be extracted from coal, he said, with the waste gases injected into underground reservoirs rather than being released to the atmosphere.

Lieberman pledged to protect sensitive areas—specifically including the Arctic National Wildlife Refuge—from drilling for oil and gas. The Bush administration favors exploration in the refuge, and that difference has acquired great symbolic importance in the struggles over the administration's energy bill as it moves through Congress.

As president, Lieberman said, he would "work to unleash a spirit of national purpose" in meeting the country's energy needs in ways consistent with environmental values.

In introducing Lieberman, RFF President Paul Portney noted that throughout its history RFF has provided a public forum for open debate about important resource issues facing our country. Speakers have ranged from President Dwight D. Eisenhower in 1953, shortly after RFF was founded, to Christie Todd Whitman, the current head of the Environmental Protection Agency, at RFF's 50<sup>th</sup> anniversary celebration last year. ■



*John Anderson  
is journalist-in-  
residence at RFF.*

## Valuing Risks to Life and Health

### Alternative Approaches to Valuing the Health Benefits of New Government Regulations

**T**he Office of Management and Budget (OMB) has proposed new draft guidelines for federal agencies that could change how regulators weigh the benefits, costs, and risks involved in creating new regulations. They are part of a larger Bush administration effort to move toward more performance-based budgeting and a greater focus on cost-effectiveness and net benefits. Public debate has centered on whether the assessment methods outlined in the guidelines potentially favor certain sub-groups of the population over others.

RFF was asked by OMB and the Environmental Protection Agency's (EPA) National Center for Environmental Economics to convene a conference to discuss the draft guidelines and their implications for policy analysis. Speaking at the conference, held in February, John Graham, OMB head of information and regulatory affairs, called the questions being addressed "central to the quest for more efficiency and fairness in the health and safety policies of the federal government."

The conference, which was organized by RFF Senior Fellows Alan Krupnick and Michael Taylor, was held in conjunction with the Department of Agriculture, Food and Drug Administration (FDA), Agency for Healthcare Research and Quality, Department of Transportation,

Occupational Safety and Health Administration, and National Institutes of Health.

Government agencies are required to evaluate the benefits and costs of major regulations, defined as those likely to cost \$100 million or more. The draft guidelines, which were created to improve analysis of proposed regulations and promote harmonization of methods, call for agencies to perform both BCA (benefit-cost analysis) and CEA (cost-effectiveness analysis). Traditionally agencies have relied on one or the other, and sometimes different parts of an agency rely on different approaches.

#### Right Tool for the Job

Graham suggested that both CEA and BCA have something to contribute to policy decisions. He characterized CEA as a "bang-for-the-buck exercise" that provides information about which regulatory alternatives will produce the most health gains per unit of resource investment." However, he said, "since CEA only provides relative comparisons, we need BCA to determine whether the benefits of any particular alternative justify the costs."

For regulations that reduce mortality risk, OMB calls for BCA using both the value of a statistical life and the value of a statistical life-year. The latter is used in the "life-expectancy" approach, which quantifies life-years



**Above: OMB Head of Information and Regulatory Affairs John Graham.**



**Top, from left: RFF Senior Fellow Michael Taylor, FDA Commissioner Mark McClellan, and EPA Chief of Staff Tom Gibson. | Above: RFF Senior Fellow Alan Krupnick.**

gained under a policy rather than just mortality avoided, and typically leads to lower benefits estimates than traditional mortality valuation and is thus considered controversial. While this practice was included in earlier versions of the guidelines and included in regulatory analyses that were conducted under the Clinton administration, it has resurfaced as a point of contention between environmentalists and the current administration, which critics fear could use results generated with the approach to justify less stringent environmental regulations.

The conference explored in detail

two approaches to valuing health outcomes that frequently underlie BCA and CEA—willingness-to-pay (WTP), which is commonly used in BCA, and quality-adjusted life years (QALYs), which are often used in CEA. WTP measures and CBA are used in many applications, particularly by EPA. QALYs and CEA have been used widely in medical applications. As the line between environmental and public health policy becomes increasingly blurred, however, the need for greater harmonization becomes apparent.

“As a policymaker I want to know why an analyst may choose one or

## *Does the choice of valuation method lead to significantly different results?*

MICHAEL TAYLOR

another of the methods,” says RFF’s Michael Taylor. “Is one more accurate or reliable than the other? Do they differ in the assumptions or values on which they are based? Is one easier to use than the other? Does the choice of valuation method lead to significantly different results?”

The answers to these questions, panelists agreed, do not come easily. Each approach is underscored by varying philosophies and different disciplines, and beyond the highly technical jargon is an added complication: poor communication and understanding across disciplinary lines. RFF’s Alan Krupnick is developing a report, for submission to OMB that would compare both methodologies on the assumptions each method makes about human preferences and equity concerns.

Policymakers also stressed the need for improved information on valuation. EPA Chief of Staff Tom Gibson told participants that inconsistency and inaccurate information—as well as pressing deadlines—make valuation and rulemaking very difficult. “We’re not economists but we’re confronted with all the jargon of economists. We’ve got to grapple with things like willingness-to-pay, value of statistical life, QALYs, children’s

health, health of the aged, social welfare, social costs, and impacts on small business.”

FDA Commissioner Mark McClellan said his agency had a complex mission with many new regulatory challenges relating to a growing diversity of individualized medical products, imports, and biotech foods. “If our regulations are not efficient, if they create unnecessary delays or additional costs in bringing safe and effective products to market, then consumers end up paying more than they need to, both in terms of dollars and, more importantly, in terms of health outcomes,” he said. “Carrying out a changing mission requires the effective use, day in day out, of the science of risk assessment and cost-benefit analysis.”

### Question of Age

Graham admits that ongoing research into assessment methodologies raises as many questions as answers. He said research efforts led by RFF’s Krupnick show that reducing the daily risks of life at age 40 is valued no more strongly by consumers than reducing similar risks of life at age 60. “Yet actuaries tell us that the typical 40-year-old stands to lose maybe twice as many expected life years as the 60-year-old,” he said. “Is it possible that life years are important, but seniors value highly the precious few life years they have remaining? Could it be that people at age 60 are often wealthier than people at age 40, and maybe their superior ability to pay is influencing these results? Are people at age 40 undervaluing their safety and their market behavior because they perceive they cannot borrow effectively against their future income stream? In order to perform high-quality BCAs, we need to get better answers to these kinds of questions.”

Indeed, the question of age is particularly controversial. OMB has been under fire by environmentalists and the elderly for its use of a “senior discount factor” which valued the lives of those over 70 at 37% less than the rest of the population, based on a study conducted in England and RFF work in Canada. However, this approach was not used in the most recent EPA analysis (of the Non-Road Diesel Engine rule), which was based, in part, on new RFF research in the United States, and EPA Administrator Christie Todd Whitman has made a point of saying that the agency will not use age-adjusted analysis in decisionmaking.

Graham complimented and thanked RFF for its efforts to produce knowledge and insight about how federal agencies can improve their regu-

latory analysis and their decisions. “I could think of no better organization than RFF to prepare this conference. Serious problems deserve the attention of talented and serious people, and that’s exactly what RFF has provided.”

RFF’s efforts in this area have continued since the February conference. In April, Krupnick and Taylor reconvened with representatives of the federal agencies that participated in the prior meeting and other experts in a workshop to discuss Krupnick’s draft report comparing methodologies for valuing health outcomes. RFF will also be submitting comments to OMB on the new guidelines.

For more information on the February conference, visit [www.rff.org/valuinghealthoutcomes.htm](http://www.rff.org/valuinghealthoutcomes.htm). ■

The event drew a broad range of participants. Here, Phaedra Corso, Centers for Disease Control, catches up with Ted Miller, Pacific Institute for Research and Evaluation.



# Voluntary Versus Mandatory Approaches to Climate Change Mitigation

Thomas P. Lyon

Despite the U.S. rejection of the Kyoto Protocol on Climate Change, pressure for action continues. Ratification of Kyoto is one (Russian) vote away from creating enforceable mandatory controls on carbon dioxide, methane, and other greenhouse gases in many nations. In anticipation, multinational companies are pressing forward with programs to reduce their greenhouse gas (GHG) emissions, and Ford, Dupont, BP America, and 25 other large companies have created the Chicago Climate Exchange for trading GHG reductions.

But another approach to environmental improvement, one that avoids mandatory controls, is also gaining currency, particularly in the United States. Public voluntary agreements (PVAs) typically involve government provision of technical assistance in meeting environmental goals, government-sponsored publicity for firms with outstanding environmental records, and information sharing among participating firms. The U.S. Environmental Protection Agency's (EPA) Energy Star program is perhaps the best-known agreement.

How does a mandatory system compare against the performance of a PVA? For simplicity, let us focus on the production and use of electricity, which is the single largest source of GHG emissions. Consider three types

of organizations that might be affected by climate policies:

**Existing Coal-Fired Electric Generating Units.** These units have little ability to reduce GHG emissions except by reducing production. Older, inefficient plants might be shut down altogether under a strict GHG control policy.

**Future Electric Generating Units.** Plants at the planning stage can use either coal or natural gas as fuel sources. As the likelihood or stringency of GHG control policy increases, gas is increasingly favored over coal, due to its lower GHG emissions.

**Electricity End-Users.** Increased energy-efficiency can enable many end-users to significantly reduce their impact on the environment, often at a modest (or perhaps even negative) net economic cost to themselves.

A mandatory cap-and-trade program defines a maximum level of emissions and issues permits (according to some allocation rule) to firms. Both generators and consumers of electricity must then incorporate the environmental consequences of their emissions into their economic decisions. If the impact of global warming is factored into fuel costs, many existing coal-fired generating units will reduce production or shut down. New generating units will have strong incentives to opt for natural gas.

Many electricity end-users will install new, energy-efficient equipment, reducing overall GHG emissions.

## Public Voluntary Agreements

Under a public voluntary agreement with government information and technical assistance, existing coal-burning generating units are unaffected; even with assistance, these plants can only reduce emissions by selling less power, and a PVA provides no reward for doing so. New generating units may be encouraged to choose natural gas if EPA will offer favorable publicity for doing so.

The primary impact of a PVA, however, will be on electricity end-users, who are encouraged to adopt new abatement technologies. The need to raise government funds to finance the program, however, means that the assistance probably will be insufficient to achieve all desirable environmental improvements. Furthermore, fewer end-users are likely to adopt new abatement technologies than under a tradable permit system, which does not rely on public funds and which affects decisionmaking directly through the pocketbook.

The bottom line is that a cap-and-trade system is inherently a more powerful regulatory instrument, in which the price system serves as both stick and carrot and affects all three groups





of market participants. However, a mandatory system of regulations that significantly reduces emissions by imposing costs upon all generating units will face political resistance. Indeed, the higher the costs imposed, the greater the political resistance. For this reason, the Clinton administration's carbon tax proposal was scuttled in favor of voluntary programs.

The Bush administration has also abandoned talk of a mandatory program. Its proposed voluntary program aims for an 18% improvement in emissions intensity (emissions per unit of output) by 2012. Early reduction credits (ERCs) would be awarded for projects that reduce emissions and would be exchangeable for permits if a mandatory cap-and-trade program were created. ERCs would be defined against a "business-as-usual" baseline. Firms that reduced their emissions below the baseline would receive ERCs. Direct sources, like generators, would obtain credits for improvements in energy efficiency; indirect sources, such as electricity users, would obtain credits for reductions in energy consumption.

Determining baselines involves forecasting, and firms might project greater energy use than would really have been expected, or claim ERCs for "anyway" reductions that would have occurred regardless. Such gaming would inflate the volume of credits issued.

The benefit of ERCs is that they encourage emissions reductions earlier rather than later, which is valuable since GHGs accumulate in the atmosphere over time. However, ERCs promise to be less effective and more costly to operate than an immediate cap-and-trade system with a generous initial cap.

#### **McCain-Lieberman**

Early in 2003, Senators John McCain (R-AZ) and Joseph Lieberman (D-CT) proposed a mandatory cap-and-trade system whose permits would be allocated at no cost, plus ERCs, which could be converted into allowances after 2010. The bill would be more lenient than the Kyoto Protocol but more rigorous than the Bush administration's goal. Since the program starts with ERCs and then moves to mandatory controls, it would incur the transaction costs of creating two

separate systems. The ERC component might also induce industry to produce short-term reductions at the expense of greater long-term efficiencies. Nevertheless, by lowering the net cost to industry of taking action to limit GHG emissions, this system may ease the transition to a mandatory system.

In the United States, political resistance to climate change legislation may still be overwhelming. Yet the increase in self-regulatory actions by multinational companies raises the ironic possibility that it will be corporate America that drags the U.S. government into the international system of greenhouse gas controls. ■

*Thomas P. Lyon is a visiting scholar at RFF. This analysis of the two approaches to pollution abatement is based on a forthcoming model by Lyon and John W. Maxwell, "Self-Regulation, Emission Taxes, and Public Voluntary Environmental Programs," to be published later this year in Journal of Public Economics.*

***In the United States, political resistance to climate change legislation may still be overwhelming.***

# Catching Market Efficiencies

## QUOTA-BASED FISHERIES MANAGEMENT

*When fishermen have access to a guaranteed share of the catch, they have an incentive to focus on the quality, not the quantity, of their catch.*

*James Sanchirico  
and Richard Newell*

Too many boats are chasing too few fish, it is said of U.S. fisheries. To address this problem, policymakers must stop treating the symptoms—by restricting gear, seasons, and areas—and focus instead on the incentives fishermen face. Individual fishing quota (IFQ) programs are a promising tool to cut economic and ecological waste in fisheries.

IFQ programs are analogous to other cap-and-trade programs, such as the sulfur dioxide allowance-trading program. They limit fishing operations by setting a total allowable catch, which is then allocated among fishing participants, typically based on historical catch. When fishermen have access to a guaranteed share of the catch, they have an incentive to stop competing to catch as much as possible and start improving the quality of their catch. When shares are transferable, inefficient vessels find it more profitable to sell their quotas than fish them. The result will be fewer and more-efficient vessels.



Worldwide, IFQs are used to manage more than 75 species, including 4 in the United States. Although assessments of these programs are generally positive, their future is unclear. In the United States, a six-year moratorium on implementing new IFQ systems expired in September 2002, but policymakers continue to debate program elements. Legislation introduced in 2001 by Senators Olympia Snowe (R-ME) and John McCain (R-AZ), for example, prohibits the selling and leasing of quota shares (S.637 §2.6.a). Many questions remain, in part because there have been limited opportunities to study the current programs.

The system in New Zealand—the world leader in implementing IFQs—provides a standout opportunity for research. Richard Newell and James Sanchirico of RFF and Suzi Kerr of Motu Economic and Public Policy Research in Wellington, New Zealand, are documenting and measuring the changes in New Zealand fisheries. Here we describe New Zealand's IFQ system and discuss its effects—distributional changes, market efficiency and economic gains, biological health, and political and administrative changes. We then suggest some implications for U.S. fisheries policy.

### **New Zealand's Quota Management System**

In 1986, New Zealand adopted IFQ programs for 26 marine species; the system now includes some 45 species. This system thus provides a wealth of information, covering more than 15 years and a large number of species that are diverse in both economic and ecological dimensions. For example, average life spans range from 1 year for squid to 125-plus years for orange roughy. Some species, such as abalone, occupy inshore tidal areas and are caught using dive gear; others are found offshore in depths over 1,000 meters and require specialized nets and large vessels.

Seafood is New Zealand's fourth-largest source of export income, and more than 90% of fishing industry revenue is derived from exports. As of the mid-1990s, the species managed under the IFQ system accounted for more than 85% of the total commercial catch taken from New Zealand's waters. We estimate that the quota markets have an estimated market capitalization of about NZ\$3 billion, which is approximately equivalent to US\$2 billion.

Under the IFQ system, the New Zealand exclusive economic zone was divided into ten quota management regions for each species based on the locations of major fish populations. Quotas for catching fish were set for each species in each region, creating a number of fishing quota markets. In 2000, the total number of fishing quota markets stood at 275, ranging from 1 for hoki to 11 for abalone. The quota rights can be split and sold in smaller quantities, and any amount

can be leased and subleased. There are limits, however, on the number of quotas that any one company or individual can hold.

The New Zealand Ministry of Fisheries sets an annual total allowable catch for each fish stock. The goal is to have fish populations that can support the largest possible annual catch—the “maximum sustainable yield”—with adjustments to account for environmental, social, and economic factors. Compliance and enforcement are undertaken through detailed reporting procedures that track the flow of fish from a vessel to a licensed fish receiver to export records, along with satellite monitoring and an at-sea surveillance program that includes on-board observers.

### **Distributional Changes**

Throughout the world, the debate about whether to implement market-based approaches in fisheries has concerned their distributional implications—the potential concentration and industrialization of the fishery. Critics of quota management systems argue that such systems will harm small-scale fishermen, a claim analogous to those made for preservation of the family farm. Proponents counter that current management practices are not sustainable, and the survival of any fishing industry—whatever the proportions of small versus large players—is better than nothing. Of course, an IFQ system could be designed to maintain a socially desirable composition of participants—in the Alaskan halibut fishery, for example, there are restrictions on who can trade with whom—but such constraints can reduce the potential efficiency gains.

*Throughout the world, the debate about whether to implement market-based approaches in fisheries has concerned their distributional implications.*

In New Zealand, there has been a 37% decline in the number of quota owners, mostly in fisheries that were overfished and had overcapacity problems. Although some small fishing enterprises have exited, many remain. In fact, the typical quota owner holds the minimum required to participate in the fishery. And although about one-quarter of the fishing quota markets are concentrated (as defined in U.S. Department of Justice antitrust regulations), these fisheries were concentrated before the introduction of IFQs. In short, the industry started out with a few big players (vertically integrated catch and food-processing companies) and many small fishing enterprises, and it looks much the same today. The size of holdings of the larger companies, however, has increased.

### Market Efficiency and Economic Gains

Whether tradable permits are being applied to fish, pollution, or other resource problems, the ability of firms to buy and sell quotas in a well-functioning market is necessary for achieving efficiency gains.

We find that the New Zealand IFQ markets have been very active, with about 140,000 annual leases and 23,000 sales of quotas as of 2000—an annual average of about 9,300 leases and 1,500 sales. In the typical quota market, the percentage of the total allowable catch that is leased in any given year has risen considerably, from 9% in 1987 to 44% in 2000.

A majority of the transactions between small and medium-sized quota owners are handled through brokers; larger companies typically have quota managers on staff. Brokers advertise quota prices and quantities for sale or lease in trade magazines, newspapers, and on the Internet and charge a brokerage fee of 1% to 3%. Differences in prices paid for the same quota in a given month have fallen, indicating that market participants are learning and these markets are developing.

We also find evidence of economically sensible behavior in the relationship between quota lease and sale prices and fishing input and output prices, quota demand, ecological variability, and market rates of return. Moreover, after controlling for relevant factors, we estimate an increase in the value of quota prices, consistent with an increase in the profitability of the fisheries. Furthermore, as theory would predict, we find larger gains for fish stocks that were initially

overcapitalized and overfished and that faced significant reductions in total allowable catches; in these cases, sale prices rose at an average annual rate of 9% and lease prices, 4%.

Overall, the results suggest that these markets are operating reasonably well, implying that market-based quota systems can be effective instruments for efficient fisheries management.

### Health of Fish Populations

IFQ programs can be used to improve the biological health of populations if the cap on total catch is appropriately set.

In New Zealand, evidence indicates that fish populations within the IFQ system are no worse off, in some cases show clear signs of recovery, and in other cases are apparently improving, given current catch levels. For more than half the fish stocks, however, sufficient data to measure changes in fish populations do not exist, and the program is too young for us to assess whether measures taken to improve fish stocks with very long life spans are succeeding.

The IFQ system has spawned some important behavioral changes in the fishing industry that might lead to an improvement in the health of fish populations. For example, New Zealand fishermen have reallocated fishing effort across locations and over the fishing year to minimize the incidental catch of nontarget fish (by-catch) and to avoid spawning aggregations. Because the system covers so many species, fishermen must reduce by-catch to avoid having to buy additional quotas in the market or pay fees to the government for the fish that are not in their quota portfolios.

### Political and Administrative Changes

Proponents of IFQ programs see many political and administrative benefits from allocating shares of the catch to individuals. One way in which the political and administrative fisheries systems have changed in New Zealand is through the formation of quota-owner management companies. These companies invest in value-added research on marketing and processing and work with government scientists to improve data collection and fish stock assessments. As one government scientist told us, "Since the adoption of the IFQ system, things have not always gone smoothly with the industry, but the creation of the management companies has re-

*In New Zealand, there has been a 37% decline in the number of quota owners, mostly in fisheries that were overfished and had overcapacity problems.*

duced the regulatory transaction costs in setting total allowable catch levels. Overall, there is less animosity between the government and the fishing industry than before the program.”

How fishery management is funded has also changed. New Zealand fishermen now pay annual fees that cover many of the governmental management costs of the program. At the same time, the fishing industry has become more directly involved in these activities.

## Implications for U.S. Policy

Our findings are relevant for the ongoing IFQ policy debates in the United States. We can infer from the behavior of the New Zealand fishermen that the flexibility of the system and the ability to transfer shares has high economic value. Furthermore, the option of short-term leases appears to have significant value, as revealed by the dramatic increase in leasing over time. In addition, the opportunity to operate in both sale and lease markets provides an additional dimension across which relevant economic and ecological information can be exchanged and rationalized.

We also find a significant decrease in the number of owners, even as the number of small players has remained high. For overcapitalized fisheries, a reduction in the number of vessels is beneficial. The United States is seeking to reduce capacity by offering fishermen money to retire their vessels, but often the takers are already on their way out, and very little reduction in fishing effort occurs. IFQ programs offer a market-based solution to this overcapacity problem that does not rely on direct payments from the government. The potential sociocultural costs associated with IFQ systems need to be weighed against the benefits of reducing fishing effort, but such concerns can be addressed within an IFQ framework.

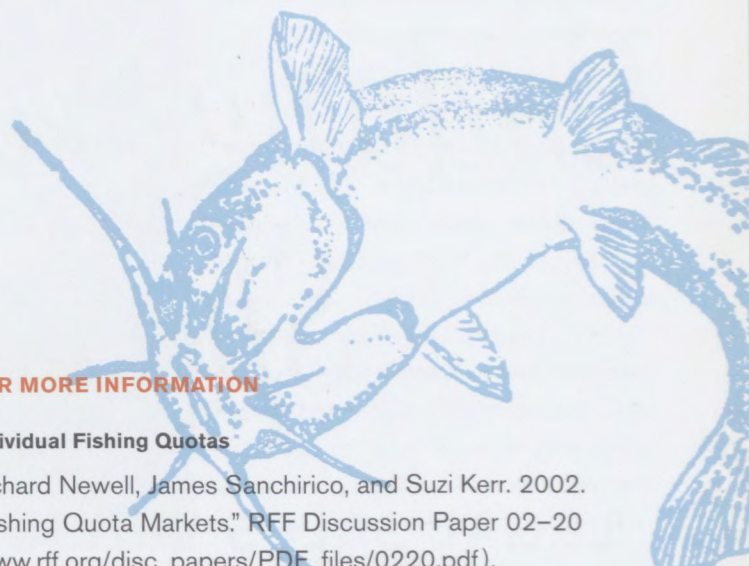
The collaborative atmosphere among the stakeholders in New Zealand fisheries management contrasts with the approximately 100 lawsuits currently pending against the U.S. National Marine Fisheries Service (the agency responsible for fishery management). The ability to set fees that recover the cost of management is appealing, especially in this time of budget deficits. This additional revenue could be used to offset the costs of data collection, scientific research, on-board observer programs, and other enforcement programs.

Furthermore, the simultaneous adoption of so many species into the New Zealand system in 1986 provided the industry with incentives to avoid by-catch and improve its stewardship of the marine environment. U.S. policymakers attempting to design single-species IFQ programs that address by-catch might want to consider adopting IFQ systems

for a much wider set of species rather than trying to engineer a solution one fishery at a time.

Finally, we estimate that the total value of New Zealand's IFQ fisheries, which account for more than 85% of the commercial catch taken in its waters, has more than doubled in real terms from 1990 to 2000, even as fish stocks are improving. Wouldn't it be great if, 10 years from now, the United States could cite similar statistics? ■

*James Sanchirico and Richard Newell are fellows at RFF. Sanchirico's work centers on the economic analysis of fishery policy design, implementation, and performance, especially the effects of policies such as individual transferable quotas and marine protected areas. Newell's research interests include the economic analysis of policy design and performance, with a particular interest in technological change and incentive-based policy.*



### FOR MORE INFORMATION

#### Individual Fishing Quotas

Richard Newell, James Sanchirico, and Suzi Kerr. 2002. "Fishing Quota Markets." RFF Discussion Paper 02-20 ([www.rff.org/disc\\_papers/PDF\\_files/0220.pdf](http://www.rff.org/disc_papers/PDF_files/0220.pdf)).

#### Environmental Defense Site on Sustainable Fisheries

([www.environmentaldefense.org/system/templates/page/subissue.cfm?subissue=1](http://www.environmentaldefense.org/system/templates/page/subissue.cfm?subissue=1))

#### New Zealand's Fisheries

New Zealand Ministry of Fisheries ([www.fish.govt.nz/](http://www.fish.govt.nz/))

Motu Economic and Public Policy Institute, Wellington, New Zealand (<http://www.motu.org.nz/>)

#### Fisheries in General

Pew Oceans Commission (<http://www.pewoceans.org/>)

U.S. National Marine Fisheries Service, NOAA (<http://www.nmfs.noaa.gov/>)

*Can market incentives from limited, legalized trade in certain products help protect endangered species?*

# Trading in Endangered Species

## LEGAL SALES VERSUS TOTAL BANS

*Carolyn Fischer*

*Carolyn Fischer is a fellow at RFF. Her research covers a variety of issues, from the design of environmental and tax policies to resource management over time. International areas of interest include the impact of multilateral trade agreements on national environmental policies and trade in endangered species products.*

**D**ebate over whether to sell confiscated endangered-species products is a regular part of the agenda at meetings of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). Rhinoceros horns, tiger bones, and turtle shells are among the banned products for which markets exist, but sales of ivory in particular have been hotly contested.

International trade in ivory was banned in 1989, after poachers in Africa killed as many as 100,000 elephants annually, halving the continent's population in a decade. Since then, conservation activities in some African nations have allowed elephant populations to recover. Seeking funds to support such work, these countries have asked for special authorization to sell stockpiled ivory.

In 1999, Botswana, Namibia, and Zimbabwe were permitted to sell to Japan about 110,000 pounds from their existing legal stocks of raw ivory—tusks of elephants that died from natural causes or as a result of government animal control programs—thereby raising US\$5 million for elephant conservation. Two years later, CITES accepted similar proposals from Botswana, Namibia, and South Africa. However, support was not unanimous among the 160 members, and similar proposals by Zambia and Zimbabwe failed out of concern that those governments could not effectively protect their elephant herds or monitor the ivory sales.

Can market incentives from limited legalized trade in certified products help protect endangered species? The effects on poaching of even limited legalized trade are unclear. According to the Environmental Investigation Agency, a non-governmental organization based in Britain, the 1999 sales encouraged elephant poaching; according to the United Nations Environment Programme and the TRAFFIC network, which monitors wildlife trading, they did not.

Traditional economic theory says that selling confiscated goods helps satisfy consumer demand and drive down prices, thus reducing the financial gains to poaching. Prohibiting confiscated goods from being sold, on the other hand, increases scarcity and drives up prices, actually encouraging illegal activity. When a larger share of poached ivory is confiscated, less gets through to the market, and poachers may then respond to the higher prices by increasing their total catch to ensure that enough of the unconfiscated share reaches the high-paying consumers.

Such economic analyses depend on two crucial assumptions: that illegally produced goods and legally sold confiscated goods are truly interchangeable, and that consumers are indifferent to both wildlife populations and the nature of

the market. The reality, of course, is more complex, leading conservationists and legal experts to discount the economists' theory. Their concerns tend to fall along four lines:

(1) certified trade would create new demand from law-abiding consumers, which would raise prices; (2) legal trade would reduce the stigma of owning endangered species products, encouraging demand, and raising prices; (3) laundering may bring illegal goods to legal markets; and (4) legal sales may lower the costs of illegal supply by making monitoring more difficult.

Given the conflicting evidence, which aspects of these complicated markets are important for determining whether limited trade in illegal goods can help achieve policy goals like reducing poaching?

### Dealing with Different Kinds of Consumers

Separate markets with different types of consumers can exist side by side. When CITES banned international trade in ivory and other endangered species products, demand from law-abiding consumers in nonproducing countries, particularly wealthy industrialized nations, fell. The remaining consumers were either domestic or those willing to engage in illegal trade.

The fear is that certified sales will reinvigorate demand from the high-paying consumers and bid up the return to poaching. However, this consequence is not unavoidable: adding a separate legal market alongside an existing black market does not necessarily lead to more poaching. Since law-abiding consumers will purchase only from certified sources, their demand does not drive up the prices for illegal sources—if anything, it would drive them down. Presumably, consumers willing to buy on the black market would buy the legal product as long as it was not more expensive. Thus, prices cannot rise in the black market.

If demand from law-abiding international consumers is great, they will purchase all the certified products and only the certified products; meanwhile, black-market consumers will find the certified prices too high and engage as before, with no change to illegal trade. If demand from the law-abiding consumers is moderate, some of the certified sales will satisfy consumers who would otherwise resort to the black market, causing those prices to fall.

Thus, either prices for uncertified goods will fall, as in the

traditional model, or they will remain unchanged. In the case of ivory, auctions of lawfully obtained products should raise revenues without any increase in harm to the elephants.

### The Question of Stigma

Part of the success of the ivory ban was attributed to the stigma it created—the perception that ivory products had been obtained through illegal or inhumane means. If that perception affects how much the consumer enjoys owning and displaying ivory, the relative share of trade in certified

goods can affect her willingness to pay. A larger market of legal products can raise her willingness to pay; more illegal trade can lower it.

A robust legal market, then, could reduce stigma, increase demand from the law-abiding consumers, and cause prices to rise in the certified market. (As long as the two markets remain separate, prices in the illegal market should not be affected.) A limited amount of legal sales, on the other hand, would tend to keep stigma high and demand low; prices would not rise, and the legal sales would satisfy some of the illegal demand. Stigma is more likely to be important for display goods, like ivory or diamonds, than for consumed goods, like medicinal rhino horn.

Some consumers may care about the state of the species or the absolute size of the illegal activity. This “outrage” factor has its roots in altruism or existence value, since personal enjoyment of the good is reduced by the scope of the harmful behavior, even if one’s own purchase was obtained in a lawful or cruelty-free manner. The effect is to reduce the willingness to pay for certified goods when poaching increases; as long as markets are separate, however, poaching incentives (and thus the degree of outrage) should remain the same.

### What if There Is Laundering?

Laundering poses a real problem for legalized trade, since it means the two markets cannot remain truly separate. If demand is high among law-abiding consumers and prices for certified products are higher than for black-market goods, incentive exists to launder illegal goods for fraudulent sale in the legal market. Part of this incentive is then passed on to



poachers, as some illegal consumption is diverted to legal markets and prices are bid up on the black market.

What policy, then, leads to the lowest price for illegally obtained goods? If law-abiding demand is low, the best policy may be to sell all the certified goods available. If stigma is strong but might fall, it may be to allow limited sales. However, if law-abiding demand would be high, the trade ban can indeed provide the lowest economic incentives for poaching.

### Lowering the Costs of Illegal Supply

But what about the supply side? The relative size and scope of the legal market could affect smuggling costs if, for example, more legal trade lowers the odds of being caught in an illegal exchange. The effects of these interactions may not be straightforward, however, and their exact form can be important. Do thriving legal markets make poaching enforcement less effective and poaching cheaper? Do they lower the costs of laundering? Or do they lower the confiscation rate for laundering?

Recall that an increase in poaching enforcement that raises the confiscation rate can have perverse effects and increase poaching activity if the price response outweighs the increase in supply costs. For the same reasons that an increase in enforcement can have uncertain effects, a reduction in enforcement effectiveness can also have ambiguous effects. On the other hand, if legal sales have supply interactions that directly lower poaching or laundering costs (rather than lowering confiscation), illegal activities could increase. Still, it does not necessarily follow that a trade ban minimizes poaching, since the optimal policy must balance the demand effects as well.

### Balancing Trade Effects

Appropriate trade and enforcement policy for endangered species products thus requires a reasonable sense of the demand and supply parameters. For example, if lawful demand for rhino horn is low and most consumers are indifferent to certification, the trade ban is likely to be ineffectual in reducing demand, and selling confiscated products would bring down prices, primarily by increasing supply to consumers indifferent to the law. But if ivory is in demand by law-abiding consumers sensitive to the stigma, sales of some but perhaps not all the available stock may help reduce the return to poaching.

Understanding the demand variables for the products in question is essential for research. Unfortunately, and understandably, good data for black-market sales are not available; the next most reliable data sources are studies of the Japanese ivory market, the designated consumer of legal African

ivory sales. It appears that market separation and stigma may be at play. In the two decades before the international ivory ban, domestic prices remained relatively constant at 18,000 to 20,000 yen per kilogram (kg) for large tusks. Shortly after the ban, prices peaked at 180,000 yen and then gradually fell to a stable price of 60,000 yen (US\$450) per kg. This pattern would be consistent with an initial restriction of legal supply and then growing stigma as legal stocks dwindled relative to illegal supplies.

Meanwhile, the surveyed price for smuggled ivory is considerably lower, at 20,000 to 25,000 yen per kg, which is consistent with separated markets. Original supplier costs might be 6,000 to 8,000 yen, with the difference attributed to mark-ups by middlemen—the smugglers. Prices for Japanese ivory imports from Botswana, Namibia, and Zimbabwe rose from 14,941 yen per kg in 1983 to 37,216 in 1989, as elephant populations dwindled and the ban loomed. Prices for the 1999 transactions averaged 10,904 yen per kg, considerably lower than before the ban, perhaps reflecting stigma effects. However, drawing strong inferences from price data is tricky: ivory characteristics vary (by origin and by tusk size), and since five dealers dominate the legal market in Japan, prices may be distorted by their power over the market.

Clearly, there are price incentives for poaching, but the ultimate solution may require a broader approach. Restricting trade has several consequences, including forgone enjoyment of the products, enforcement costs, and wildlife management costs, not to mention community impacts of changes in the species population. Furthermore, the revenue from certified sales could be important to poor countries. If the goal is to maximize welfare, determining optimal policy involves more complex issues, not the least of which is defining welfare. Should one care about the utility of illegal consumers or illegal producers? How does stigma affect the evaluation of the utility of law-abiding consumers? Stigma can be a policy tool for demand management, as in the slogan for the People for the Ethical Treatment of Animals' anti-fur campaign: "I'd rather go naked than wear fur." By reducing law-abiding consumer demand, one could make a certified sales policy more effective at driving down the return to poaching.

The complications analyzed here are not restricted to ivory and other endangered species products. The "blood" diamonds from war-torn areas like the Democratic Republic of Congo involve issues of stigma in demand and laundering in supply. Other products with segregated markets include GMO-free (genetically modified organisms), cruelty-free, or organic produce; certified, sustainably harvested timber; drugs; and guns. Understanding real market interactions will be critical to evaluating the effects of banning or restricting sales of many kinds of products that society finds troubling. ■



# A Market Approach to Land Preservation

*Virginia McConnell, Margaret Walls, and Elizabeth Kopits*

**As more and more agricultural land is turned over for development, many government officials are turning to new tools to control sprawl, including transferable development rights.**

**T**he rate of conversion of agricultural land and open space to development has accelerated over the past several decades. The combination of larger lot sizes, more affordable housing at distant locations from center cities, and increasing reliance on vehicles has encouraged the conversion to housing of nearly a million more acres per year, compared with 20 years ago.<sup>1</sup>

As development spreads, there is a growing concern about lost farmland, open space, and environmentally valuable areas that may have public value beyond their private value to landowners. Even though the extent and magnitude of the public value of this “undeveloped” land is uncertain and the subject of controversy, land trusts have purchased or placed easements on some 5 million acres in the United States since 1982.<sup>2</sup> Many elected officials in state and local government have made controlling “sprawl” a priority, and the 2002 Farm Bill authorized nearly \$600 million over six years for the federal Farmland Protection Program. Here, we examine a market-based policy tool for preserving farmland and open space—transferable development rights (TDRs).

## *How TDRs Work*

**I**n TDR programs, the right to develop a parcel of land is severed from ownership of the land itself, and a market is created with buyers and sellers of development rights. Those who sell development rights permanently preserve their land in its current undeveloped state (for example, as farmland); purchasers of development rights are typically developers who want to build houses at a greater density than allowed by local zoning ordinances.

Often, TDR markets are used to try to channel development away from areas considered valuable for farming or

other undeveloped uses (so-called sending areas), toward already-developed areas with infrastructure to handle additional development (receiving areas). In this way, TDR markets promote more efficient development patterns and compensate landowners for lost development potential.

TDRs were first used in the United States in the 1960s, but their use has grown in recent years. About 135 programs are in place, with such objectives as preserving farmland, safeguarding unique natural areas or historic landmarks, and protecting environmentally sensitive areas.

## *Difficulties in Implementation*

**D**espite their potential, only a few programs have been successful in maintaining active and efficient markets for TDRs. One major difficulty in many programs is an imbalance between demand and supply. Often, large areas targeted for preservation are designated as sending areas and the zoning density is reduced, prompting a large number of landowners to sell development rights. Demand for these rights on the developers’ side, however, may be insufficient if homebuyers are satisfied with the densities permitted in receiving areas under baseline zoning. This is common in many urban programs—Atlanta and Oakland, California, are two examples—where TDRs have been used to direct growth to already-developed areas that have high-density zoning. An imbalance can also occur in low-density rural communities; programs in Chesterfield Township, Pennsylvania, and several Florida programs, for example, have had little demand for building beyond the relatively low baseline density limits.

Regulatory conflicts can impede TDR markets as well. Lack of infrastructure in receiving areas or binding environmental and development regulations often prevent

densities from exceeding baseline zoning. Island County, Washington, and Springfield Township, Pennsylvania, for example, reportedly lack the sewer service necessary to achieve the density bonuses allowed under TDR. In Lee County, Florida, hurricane evacuation restrictions prevent building in some TDR receiving areas. In many suburban counties, development moratoria imposed under adequate public facilities ordinances can delay development and dampen TDR demand. Demand for TDRs is further decreased if communities allow density increases through other mechanisms, such as clustering, planned unit developments, or in-lieu fees.

Another common problem is the lack of good information about the market. Since TDRs are primarily a county-level planning tool, the potential size of a TDR market is limited. Transactions in most programs number only tens or at most a hundred a year, making it difficult to establish a record of transactions that provides critical information for potential entrants. In these "thin" markets, either developers on the demand side or landowners on the supply side can dominate and prevent the TDR market from operating efficiently.

In addition, complex and time-consuming TDR transfer processes can deter potential market participants. In Boulder County, Colorado, for example, densities can be tripled with the use of TDR, but because receiving areas are not predetermined, a lengthy and uncertain public hearing process deters developers. Even when receiving areas are predetermined, as in Montgomery County, Maryland, opposition from existing residents can make it difficult for developers to achieve TDR density bonuses. In the New Jersey Pinelands, the establishment of a credit bank and a strong marketing campaign helped to simplify the complexities of the transaction process, making TDRs more attractive to developers.

### *A Policy Alternative: PDRs*

**T**he difficulties of maintaining active TDR programs have caused some communities to rely more heavily on alternative tools to preserve farmland and open space. In a purchase of development rights (PDR) program, as in a TDR program, landowners voluntarily sell their rights to develop a parcel of land, but the development rights are not used to increase density elsewhere. Rather, the government or a private land trust buys the development rights and essentially retires them.

An obvious drawback of a government PDR program is that the government must raise the revenue to purchase the development rights. On the other hand, the vagaries of

the housing market and baseline zoning in residential areas do not affect the government demand for development rights, as they do in private TDR sales. Moreover, the government may be able to target lands for preservation more easily in a PDR program.

RFF has examined one program that is primarily a TDR program but includes some elements of a government PDR program—a farm and forestland preservation effort in Calvert County, Maryland, established in 1978. This program, after 25 years of operation, appears to be working well: the market for development rights is active and stable, and TDR sales have permanently preserved nearly 13,000 acres of land.

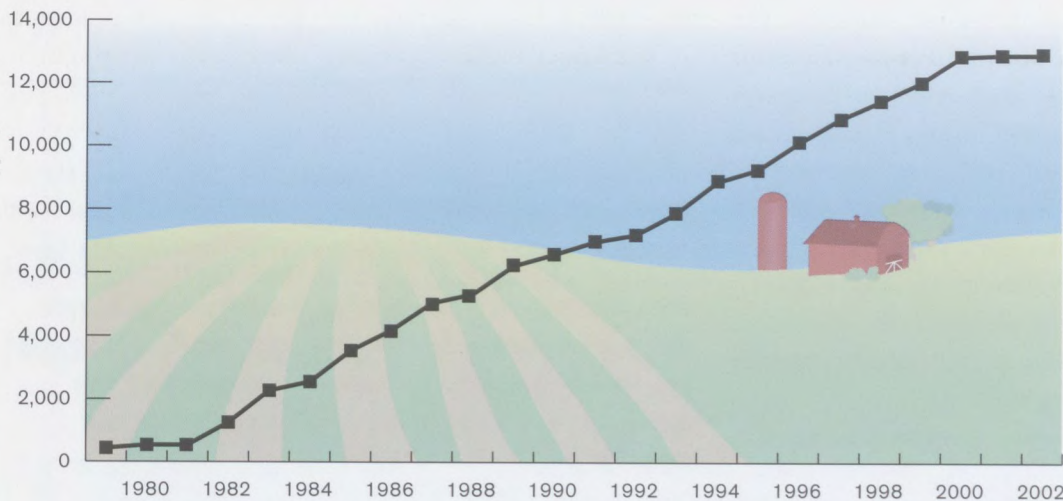
### *The Calvert County Program*

**C**alvert County is within commuting distance of Washington, DC, Baltimore, and Annapolis, and has seen the fastest rate of housing growth of all Maryland counties in past decade. The county's preservation program has several unique features. First, any farming or forested property with productive soils is eligible to enter the program and sell TDRs; its location does not matter. Unlike many other TDR programs, there was no downzoning or reduced density of targeted preservation areas.

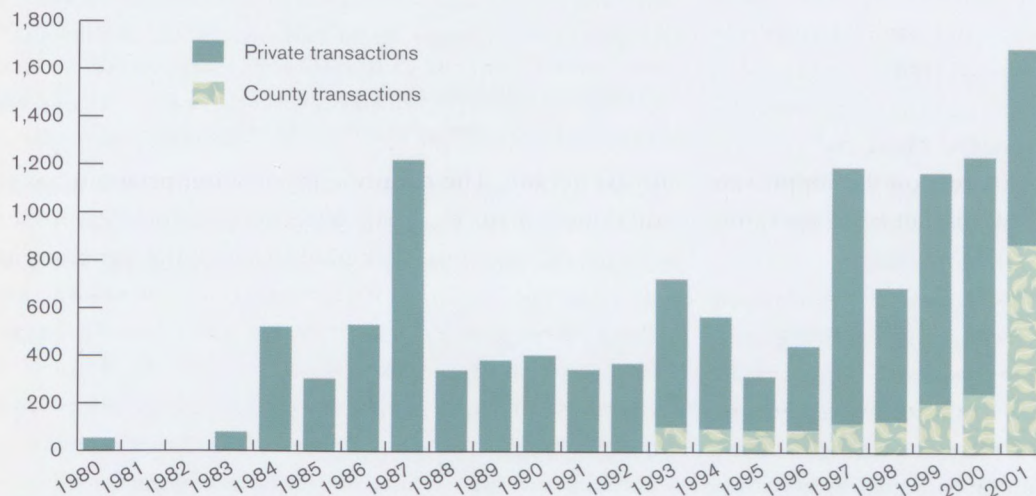
Second, although some farming regions targeted as particularly valuable for preservation were designated as sending areas only, much of the rural land can become either a sending or a receiving area. In these regions property owners have the option of selling TDRs and preserving their farmland, developing their properties, or buying TDRs and developing their properties beyond the baseline zoning limits.

A third unusual feature of Calvert's program is that an entire parcel of land is preserved when a single TDR is sold off that parcel. In other words, a farmer may be allocated, based on her acreage, 50 TDRs, but once she sells the first TDR, her entire farm is in permanent easement status.<sup>3</sup> Hence, the timing of decisions can be critical. Moreover, landowners' trust in the viability and longevity of the program must be strong.

Finally, Calvert's current program has evolved as a combination TDR and PDR program. The county government became a direct participant in the TDR market in 1993 when it began buying and retiring TDRs. Purchases fluctuate from year to year, but in 2000, the county bought 252 TDRs in 21 transactions. Although private developers are more active in this market—in 2000, buying 989 TDRs in 43 transactions—the county is still a significant force in the marketplace. Figure 1 shows the combined acres preserved



**Figure 1.**  
Cumulative preserved  
acreage, Calvert County  
TDR program



**Figure 2.**  
TDRs sold by year,  
Calvert County TDR  
program

in the program, through both county and private market transactions, from 1978 through 2002.

### *Our Assessment of the Calvert Program*

The Calvert County program's minimal constraints on both sending and receiving areas have affected the spatial patterns of preservation and development. We found that TDR demand was highest in rural communities where baseline zoning permitted one housing unit per five acres, but the purchase of development rights would allow density to be increased to one unit per two acres. There was little use of development rights in residential or town center areas, where baseline density ranged from one to four houses per acre.<sup>4</sup> This suggests that the failure to create higher-density development through TDR programs may be partly due to low demand for such housing.

Our analysis also found that the TDR program is permanently preserving farmland in the regions identified as most important for preservation—the rural areas that were

designated as sending areas only. Of the TDRs sold to date, about 80% were sold from these sending areas.

We found that most of the TDR supply—especially in the early years of the program—has come from farms in the central and southern part of the county—areas less valuable for development because they are farther from Washington, Baltimore, and Annapolis. TDRs are being used to increase development relatively more in the northern part of the county.

Political opposition to the program has been minimized in several ways. When the TDR program was implemented, the county zoning designations were not changed. Development is not completely prohibited in any part of the county: all rural land may still be developed at a rate of one dwelling unit per five acres. This flexibility reduces the potential for local opposition to the adoption of TDRs and the legal battles that have often followed in other TDR programs after a targeted sending area is downzoned. The county recently downzoned<sup>5</sup> but did so in all areas, as a way of reducing overall development.

The county's role as TDR purchaser has enhanced the working of the market in several ways. It has provided information about TDR prices to potential market participants and helped establish a more efficient market with less price variability. The county government has announced its intention to buy TDRs each year at a price that is slightly above the average of the previous year's price. In 1999, for example, the minimum and maximum prices were \$2,200 and \$2,800, respectively, and 50% of all transactions in that year occurred at prices between \$2,400 and \$2,600. In 1990, the range was much greater, and 50% of all transactions occurred at prices between \$1,209 and \$2,780 (in 1999 dollars).

Government participation in the program has also increased overall market activity. Figure 2 shows the number of TDRs sold over time. Between 1980 and 1992, the average was 9 transactions and 417 TDRs per year. After 1992, when the county began purchasing, these numbers increased to 29 and 675, respectively. Thus, the county's role in the market appears to have increased private market confidence in the program and helped alleviate the problems of "thin" markets and lack of information.

Although Calvert's private TDR program is not as prescriptive about the location of sending and receiving areas as most programs, it does allow the county to target certain parcels for preservation. The cost to the county is reduced because an entire parcel is preserved once a single TDR is sold. To date, the county has spent a little over \$2.7 million to bring new farms into the program, preserving more than 3,300 acres at an average cost of approximately US\$800 per acre preserved.

## Conclusions

The Calvert County farmland preservation program shows that a transferable development rights program can be a cost-effective way of managing land uses on the urban fringe. With a relatively straightforward structure, good underlying market fundamentals, and the county's participation in purchasing development rights in the TDR market and providing information to market participants, the Calvert TDR program appears to be achieving its goals.

Because the market seemed to stabilize when the county became a participant, combining PDR with TDR may work better than using either type of program alone. Having a market-based TDR program leverages government PDR funds for more acreage preservation, and at the same time allows private markets to channel development to locations where more density is demanded. ■

## For More Information

**American Farmland Trust.** ([www.farmlandinfo.org/fic/tas/tafs-tdr.html](http://www.farmlandinfo.org/fic/tas/tafs-tdr.html))

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## NOTES

1 Economic Research Service, USDA.  
[www.ers.usda.gov/Briefing/LandUse/Gallery/devland.htm](http://www.ers.usda.gov/Briefing/LandUse/Gallery/devland.htm).

2 Land Trust Alliance. 2000. [www.lta.org/census.html](http://www.lta.org/census.html).

3 In other TDR programs, an owner can sell an easement for part of a property but retain full development rights for the remainder.

4 Until a zoning change in 1999, one residential category allowed developers to build townhouses and apartment buildings at densities up to 14 units per acre.

5 Several lawsuits have been brought arguing that TDRs constitute a taking of property rights.

*Virginia McConnell is a senior fellow and Margaret Walls, a resident scholar at RFF. Elizabeth Kopits is an RFF research assistant. McConnell works on environmental issues related to air pollution and urban transportation. Her recent focus has been on the link between urban growth and the environment, including the role of economic incentives to achieve more efficient urban growth. Walls' current research focuses primarily on solid waste and recycling; she has also investigated transportation, urban land use, and air quality issues.*

### RFF Board Seats Cropper, Health Economist

The newest member of RFF's board of directors is an old friend of the organization and a familiar face at 1616 P Street. Maureen L. Cropper won a Gilbert F. White Fellowship in 1986–87, has twice been a University Fellow (in 1987–90 and again in 1996–98), and was a senior fellow in 1990–93. She now joins the board while continuing to serve as lead economist for the Policy Research Department at the World Bank, professor of economics at the University of Maryland, and a member of the Environmental Protection Agency's Science Advisory Board.

"RFF is unique in its focus," Cropper observes, "with people doing rigorous academic work *and* relating it to policy. This is where I began to do work that was policy relevant. I'm grateful to RFF for its role in my career, and I want to give something back to the organization."

"We are especially pleased that Maureen has agreed to join the board," says RFF President Paul Portney. "She's one of the world's best environmental economists and she'll help ensure the quality of RFF's academic work for years to come."

As an economist specializing in environmental health issues, Cropper brings considerable expertise to one of RFF's core areas, public health and the environment. Her research has centered on valuing the health

benefits of environmental programs and studies of the political economy of environmental regulation. Recently she has studied the economics of deforestation in developing countries and the valuation of health impacts of particulate matter in India.

Cropper has examined critical issues from both empirical and theoretical perspectives. She has studied the optimal depletion of natural resources, extinction of common property resources, public preferences for saving lives at different times and among persons of different ages, and EPA decisionmaking that infers the value of lives saved by environmental regulations.

#### Collaborations with RFF

She was a panelist at RFF's February 2003 conference "Valuing Health Outcomes" and has collaborated with RFF researchers on many important publications. "My own most important work," she says, "has been done in conjunction with RFF people." In 1992 she coauthored a review of the environmental economics literature with RFF University Fellow and University of Maryland colleague Wallace E. Oates, published in the *Journal of Economic Literature*. She and RFF President Paul R. Portney wrote the chapter "Environmental Federalism: Welfare Losses from Uniform National Drinking Water Standards"



MAUREEN L. CROPPER

*RFF is unique in its focus with people doing rigorous academic work and relating it to policy.*

in *Environmental and Public Economics: Essays in Honor of Wallace E. Oates* (1999), along with numerous journal articles.

She has coauthored papers with Alan J. Krupnick on the effect of information on health risk valuations; with Krupnick, Anna Alberini, and Winston Harrington on the value of reduced morbidity in Taiwan; with Krupnick and Alberini on contingent-valuation surveys to determine willingness to pay for mortality risk reductions; and with Dallas Burtraw and Karen Palmer on sulfur dioxide control by electric utilities.

Her monograph *Valuing Environmental Benefits: The Selected Essays of Maureen Cropper* was published by Edward Elgar in 1999.

Cropper earned her Ph.D. from Cornell University in 1973. Before joining the Maryland faculty in 1980, she taught at the University of California–Riverside and at the University of Southern California. She is a past president of the Association of Environmental and Resource Economists. ■

## RFF Council Meets on Energy Technology

**O**n April 10–11, members of the RFF Board of Directors and Council met in Santa Barbara to discuss the appropriate role for government in the development of advanced energy technologies. Special presentations highlighted the stages of development of specific technologies, including hydrogen for vehicle use, carbon capture and sequestration, nuclear, and renewables. James R. Mahoney, assistant secretary of commerce for oceans and atmosphere and deputy administrator, National Oceanic and Atmospheric Administration, delivered the keynote address on the Bush administration's climate science program.

The Council recognizes RFF's most significant individual and corporate contributors. Their gifts help to underwrite RFF's research and public education activities on a broad spectrum of issues—from antibiotic resistance to zero emission vehicles. For more information on the Council, please contact Lesli A. Creedon, corporate secretary and director of development, at (202) 328-5016 or [creedon@rff.org](mailto:creedon@rff.org). ■



**Top left:** RFF Trustees Maureen Cropper, lead economist for policy research, the World Bank, and Larry Linden, advisory director, Goldman Sachs. | **Bottom Left:** Hal Harvey, program officer for the environment, William and Flora Hewlett Foundation, offers an analysis of current government energy policies. | **Top right:** David Hawkins, RFF trustee and senior attorney, Air and Energy

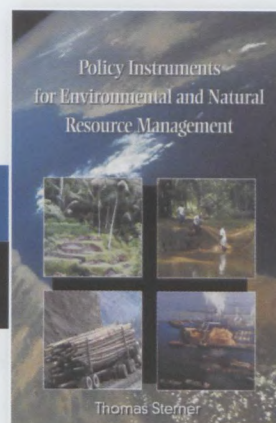
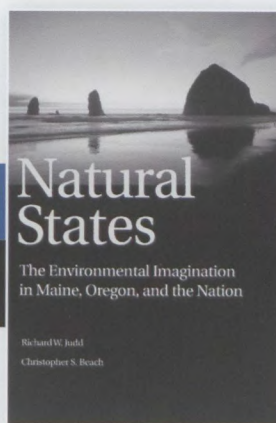
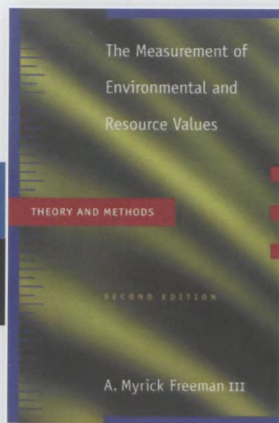
Program for the Natural Resources Defense Council, and Dale Heydlauff, senior vice president—environmental affairs, American Electric Power. | **Bottom right:** Jim Lang, director, power production, Electric Power Research Institute, and Byron McCormick, executive director, fuel cell research, General Motors Corporation.

### Recent Gifts and Grants

*RFF would like to acknowledge the generous gifts of two companies who are new contributors to the institution: ExxonMobil Corporation (\$25,000) and Consolidated Edison (\$5,000). They join almost 60 other companies in providing unrestricted support to help underwrite RFF's research and public education activities.*

*RFF also recently received grants from the following philanthropic organizations for specific research projects:*

- \$31,000 from The William and Flora Hewlett Foundation for a workshop on public policy, learning-by-doing, and technological progress
- \$50,000 from The Tinker Foundation to study policies to preserve Mexican shade-coffee
- \$50,000 from The G. Unger Vetlesen Foundation to support climate change related public education activities
- \$75,000 from the Ford Foundation for "Clearing the Air: Why Air Quality Reforms Finally Took Hold in Delhi"
- \$173,102 from the Robert Wood Johnson Foundation to support the development of a model for evaluating and ranking the public health impact of foodborne disease



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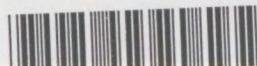
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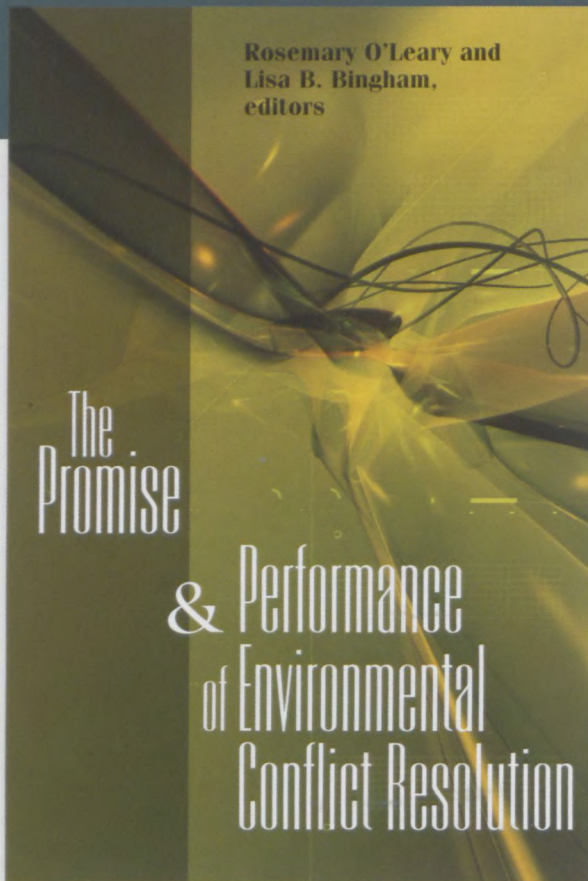
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