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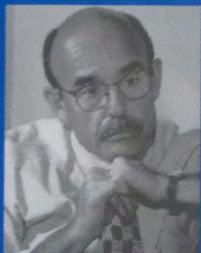
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Choice Makes Change— Despite Uncertainties



Paul R. Portney

If nothing is certain but death and taxes, there is no reason to expect certitude from research. And yet we can't help but yearn for it when we pick up publications like this latest issue of *Resources*. In reading Warren Robinson's feature, for example, we wish that this expert in demographics could assure us that the evidence of declining fertility and a possible eventual stabilization in world population were based on more than theories, trends, and hypothetical scenarios. We would like to know for sure which way the world is growing.

As Robinson points out, however, the main reason for uncertainty has to do with us. How many people will populate the planet all comes down to the personal decisions people make about how many children to have.

It turns out the significance of individual choice is central to many other contributions to this issue.

Like any good researcher, RFF Fellow Jim Boyd offers us uncertainty by qualifying his findings on pollution prevention, in this case noting that his scope of study was small. Yet he shows reason for confidence in the ability of business people to decide just how much pollution prevention makes sense from a bottom-line standpoint.

Senior Fellow Kate Probst's feature points up the terrible folly of some of the decisions we make. In the heyday of the nuclear arms race we decided to dispose of radioactive and other hazardous materials in often reckless fashion. But, as she writes, the only way out of the mess is to make more decisions—and hope we do a better job this time.

If the world hasn't gone entirely to hell in a handbasket, it is because enough good decisions are made to solve enough bad problems. To generate the political will to act, however, we rely quite a bit on the Cassandras among us. Yet the accuracy of their forecasts is not very good—a dilemma that Wally Oates and I point out here.

To be or not to be environmentally responsible is rarely a decision made in isolation. In her talk with J.W. Anderson, RFF board member Cathy Abbott notes, for example, how some corporations want to be seen as environmentally sensitive in the public eye. But they'll need feedback, she says, to keep up the good work. The public in other words will need to make responsible choices, too.

Which brings us to you, our readers. Once again, we want to thank you for choosing to support our research in ways that are often innovative in their own right. Your choices contribute mightily to the quality of our work—of that, at least, we are certain.



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In Brief

Donors back CRM project: RFF's Center for Risk Management has initiated a new project that has as its goal increasing public attention to the issues raised by the contamination and environmental risks left behind from decades of nuclear weapons production in the United States. The Center received grants totaling \$75,000 from the W. Alton Jones Foundation and the John Merck Fund to support this project.

CRM hosts workshop on stewardship: CRM Director Terry Davies and Senior Fellow Kate Probst hosted RFF's second annual workshop on long-term stewardship and the nuclear weapons complex. DOE and EPA officials as well as site-level stakeholders participated in the two-day event in April. (See Probst's related feature article starting on page 14 of this issue.)

Climate change coverage expands on the web: Looking ahead to the Fourth Conference of Parties (COP-4) in Argentina in November 1998, RFF has launched "En Route to Buenos Aires." This new section at www.weathervane.rff.org will track which countries sign the Kyoto Protocol. It will also report on significant developments leading up to COP-4.

Policy pointers receive wider circulation: The U.S. Information Agency is reprinting "Climate Change Policy After Kyoto," an article that senior RFF analysts Raymond J. Kopp, Richard D. Morgenstern, and Michael A. Toman wrote for the Winter

1997 *Resources*. The feature will appear in *Climate Change: The Choices*, a special edition of USIA's quarterly electronic journal.

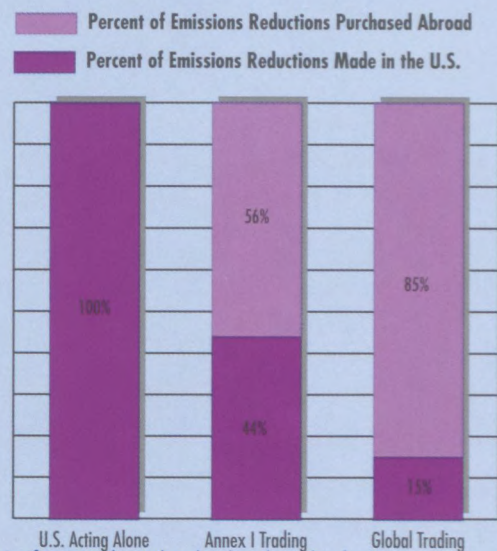
Emissions banking idea piques interest on Capitol Hill: Kopp and RFF Fellow Billy Pizer paid a visit to the Senate Environmental and Public Works Committee recently, where they briefed staff members on the concept of banking greenhouse gas emissions reductions. Their analysis appears in an article titled "Cheap Emissions Reductions: Use 'em or Lose 'em," posted at www.weathervane.rff.org.

New study of retail electricity discussed on the talk circuit: RFF Fellow Karen L. Palmer spoke to groups at the Energy Information Administration and the University of California-Berkeley about the results of a recent study she conducted with Fellow Amy W. Ando to see what factors may influence the rate at which legislators and regulators move toward retail competition. To order "Getting on the Map: The Political Economy of State-Level Electricity Restructuring" (98-18), see page 22 or access a copy at www.rff.org. ☎

Just say no to shuttle subsidies

Opening space shuttle operations to private industry, as NASA began to do last year, is a great idea, RFF researchers say. But in an article that appeared this winter in *Space News*, Senior Fellows Molly K.

Buying Emissions Reductions Abroad—Three U.S. Scenarios



Note: Annex I refers to industrialized rather than developing countries. Excerpted from: Kopp, Raymond J. and Anderson, J.W., "Estimating the Costs of Kyoto: How Plausible are the Clinton Administration's Figures?" available at <http://www.weathervane.rff.org/features/feature034.html>
Source: "Return to 1990: The Cost of Mitigating United States Carbon Emissions in the Post-2000 Period," Edmonds et al., October 1997, Pacific Northwest Laboratory, PNNL document number 11819.

Macauley and Timothy J. Brennan warn NASA away from its plan to subsidize commercial satellite launches. Such launches are used for satellite transmission of network and cable television, stock quotes, banking data, telephone calls, and electronic journalism.

Now a proven technology, the space shuttle is no longer in need of the public support it once depended on to absorb some of the R&D costs of its early days, Macauley and Brennan write. If NASA subsidizes launch fees for commercial payloads, taxpayers inevitably will foot the bill for some payloads that are not

worth the costs, namely the very launches that private companies would not pay for on their own. In terms of future space technology development, taxpayers would likewise spend more than they would gain, the researchers conclude.

Such subsidies also discourage competition and innovation, Macauley and Brennan maintain. Reviving publicly subsidized commercial launches would, for example, undercut the firms that are now building reusable launch vehicles capable of returning payloads to Earth for repair.

Without the subsidies, NASA will get a real sense of



demand for its shuttle service. If the demand is not there, the space agency could use shuttle capacity for other functions such as scientific research or simply save taxpayers money by reducing the number of launches.

"It is time," Macauley and Brennan conclude, "for NASA to hand the commercial space baton over to the private sector, accept congratulations for a job very well done, and redirect its scarce funds to fundamental science and space exploration." ☰

Climate policy: overlooked gains

Mention global warming and, more often than not, debate ensues about just how much it is going to cost to reduce U.S. emissions of carbon dioxide and other greenhouse gases. Benefits that may offset at least some of the costs often go unmentioned, aside from the obvious—and controversial—one of reducing the risk of calamitous climate change. Yet researchers are finding that at least some of the rewards of reducing CO₂ emissions could be enjoyed here and now. One of them is cleaner air.

The reason is that measures to reduce emissions of carbon dioxide would likely also result in lower atmospheric concentrations of sulfur dioxide, nitrogen oxide, carbon monoxide, particulates, and ground-level ozone. These emissions are more immediate hazards to

human respiratory health, precursors of acid rain, and the cause of algae blooms in estuaries like the Chesapeake Bay. The harm they do would dissipate almost as soon as cuts in greenhouse gases occurred.

Based on their computer modeling and critical review of several recent studies, RFF researchers Dallas Burtraw and Michael A. Toman predict that the clean air benefits could amount to \$3 to \$7 per ton for controls costing \$10 to \$20 to eliminate a ton of carbon from a coal-burning electric utility's operations. The benefits could be higher, the two researchers add, in locations with denser populations and higher levels of exposure to air pollution. In New York State, for example, the clean air benefits of a modest greenhouse gas reduction

policy could be as much as \$24 for every ton of carbon eliminated at the same \$10 to \$20 cost.

What's more, under an ambitious greenhouse gas reduction program, the benefits might be much greater, although so too would be the costs. For instance, a policy to stabilize U.S. CO₂ emissions at 1990 levels might cost \$40 to \$50 for every ton of carbon eliminated on average, but could be worth \$12 to \$18 in immediate clean air benefits.

Put another way, Burtraw and Toman identify a rough rule of thumb that applies across the range of climate policies being considered and calculate that the nongreenhouse benefits of climate controls could be about 30 percent

of the cost per ton of reduced carbon. Such benefits warrant consideration alongside the costs, Burtraw and Toman say.

Ignoring these gains, they warn, could mean underestimating the net benefits of programs to combat global climate change. Such an oversight could be especially detrimental to developing nations, where the ancillary attractions of climate policies might be just the incentives needed to boost pollution control and energy efficiency. ☰

Acid rain program: worth the price

In other study findings, RFF researchers report that the public health benefits alone appear to far outweigh the costs



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of reducing the emissions of pollutants that cause acid rain. Using more conservative measures and health effect valuations than EPA used in previous studies, Senior Fellow Dallas Burtraw and his colleagues say they nonetheless endorse the agency's qualitative findings about the magnitude of the health benefits to be gained.

"The good news is that the environmental goals of the Clean Air Act are being reached and in some cases exceeded," Burtraw said when the findings were announced.

The RFF study is the first integrated assessment of both the projected costs and the benefits of Title IV of the 1990 Amendments to the Clean Air Act, which mandates reductions in the sulfur dioxide and nitrogen oxide emissions that result from coal-fired electricity generation and contribute to acid rain.

Sulfate particles in the air—which can make rain and snow acidic—also increase some people's risk of dying prematurely. The dollar value of reducing this mortality risk, by itself, measures several times the expected costs of compliance with the acid rain program, the researchers found. The RFF team also estimated significant benefits in reduced illness and better recreational and residential visibility. In contrast, the effects of acid rain on areas that were the focus of attention in the 1980s—including soils, forests, and aquatic systems—still have not

been modeled comprehensively. The evidence so far, however, suggests that the quantifiable benefits may be relatively small in comparison.

To conduct their assessment, the researchers used the tracking and analysis framework developed for the National Acid Precipitation Assessment Team, which allowed them to model more uncertainties than usual in measuring benefits and costs. They were able to make consistent assumptions about the use of fuels for electricity generation, population, and income growth in their cost-benefit comparisons.

For the year 2010, when the second phase of Title IV acid rain reduction is expected to be in full swing, the RFF research team projected the following benefits per capita in 1990 dollars: \$59 in reduced human mortality risk; \$6 in improved residential visibility; \$3.50 in reduced human morbidity; \$3.34 in improved recreational visibility; and \$0.62 in improved aquatic benefits.

By contrast, they estimate the total expected cost per capita in 1990 dollars to be less than \$6.



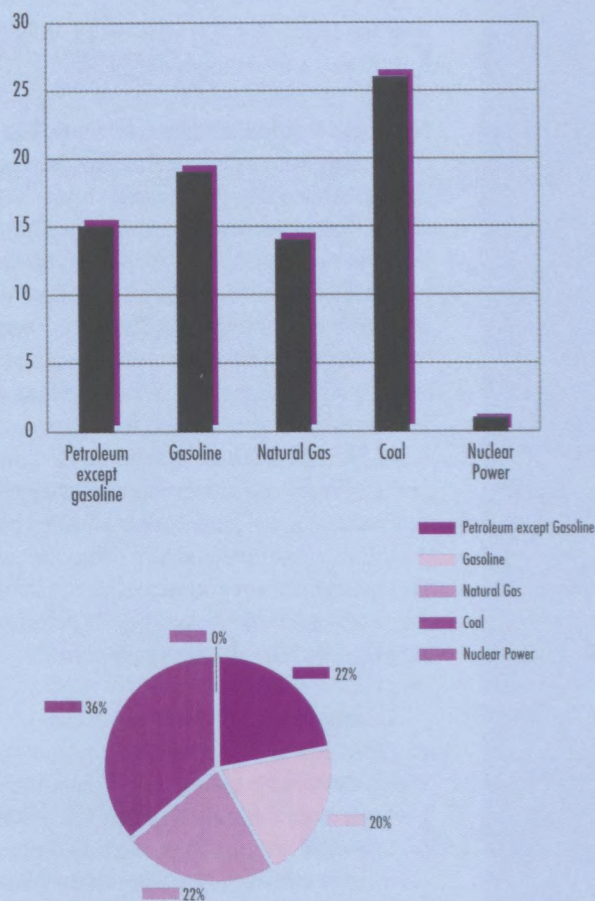
See page 22 to order copies of the papers summarized here, "The Benefits of Reduced Air Pollutants in the U.S. from Greenhouse Gas Mitigation Policies" (7-rev) and "The Costs and Benefits of Reducing Acid Rain," (97-31-rev). Access copies electronically at <http://www.rff.org>

All That Carbon Dioxide

To limit carbon dioxide emissions we must reduce the consumption of energy that contains carbon. So where do we look for those reductions? Follow the carbon. The chart below shows how much carbon each of the major energy sources contains. The vertical axis of the chart measures tons of carbon for each million BTUs of energy.

What we see is that coal contains the most carbon, followed by gasoline, petroleum products other than gasoline, natural gas, and nuclear power, which is a carbon-free source of energy.

If we combine our knowledge of energy consumption with this information about energy carbon content, we can display the shares of carbon dioxide emitted by the United States in 1995 from each of the energy types.



Source: Kopp, Raymond J. "How to Interpret Energy Data and Understand Its Role in Policy," available at <http://www.weather-vane.rff.org/numbers/primer1.html>



Global Population Trends

The Prospects for Stabilization

by Warren C. Robinson

Fertility is declining worldwide. It now seems likely that global population will stabilize within the next century. But this outcome will depend on the choices couples make throughout the world, since humans now control their demographic destiny.

For the last several decades, world population growth has been a lively topic on the public agenda. For most of the seventies and eighties, a frankly neo-Malthusian “population bomb” view was in ascendancy, predicting massive, unchecked increases in world population leading to economic and ecological catastrophe. In recent years, a pronatalist “birth dearth” lobby has emerged, with predictions of sharp declines in world population leading to totally different but equally grave economic and social consequences. To this divergence of opinion has recently been added an emotionally charged debate on international migration.

The volatile mix has exploded into a torrent of books, scholarly articles, news stories, and op-ed pieces, presenting at least superficially plausible data and convincing arguments on all sides of every question. The debate is no arcane, academic exercise. Important issues of public policy are at stake. But given disagreement among the experts, policymakers may be forgiven for ending up confused about what they can or should do.

Uncertainty is inherent in projections based on economics, public health, and sociocultural attitudes. Whether world population will stabilize—and at what level—is something that no one knows for sure. Still, demographic experts have identified probable trends in world population growth and distribution over the next fifty to a hundred years. They have also identified some of the mechanisms and driving forces underlying present trends, how they might change, and how policy might shape them.

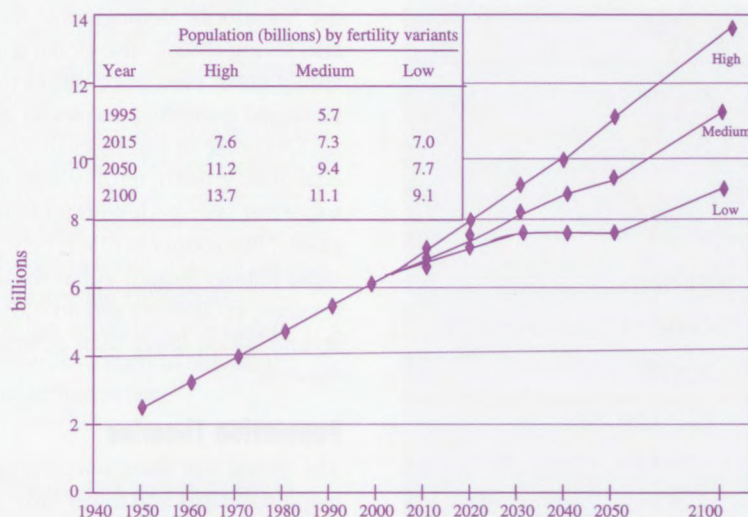
Trends in Growth

The United Nations Population Division makes varying assumptions about mortality and fertility to arrive at “high,” “medium,” and “low” estimates of future world population figures. The U.N. “medium” variant assumes mortality falling globally to life expectancies of 82.5 years for males and 87.5 for females between the years 2045–2050.

This estimate assumes that modest mortality declines will continue in the next few decades. By implication, food, water, and breathable air will not be scarce and we will hold our own against new health threats. It further assumes that policymakers will continue to support medical, scientific, and technological advances, and that such policies will continue to have about the same effect on mortality as they have had in the past. Thus average life spans will lengthen, but not dramatically.

During the same time frame, the U.N.’s medium projection shows the world’s total fertility rate (TFR) leveling off to an average of 2.1 births per woman over her span of fecundity (ages 15–49). A TFR of 2.1 equals replacement fertility, meaning that each generation replaces itself and no more. Replacement fertility sustained for roughly seventy years (with no sharp changes in mortality) produces a constant population as well as a stable age distribution. This scenario describes true zero population growth and stabilization.

The medium projection shows replacement fertility being reached with a total world population of 9.8 billion. The annual growth rate would remain 1.0



World Population Growth, 1950-2100.
 (Estimates and medium-, high-, and low-fertility variants)
 Source: Adapted from *World Population Prospects* (The United Nations: 1997)

percent, falling to zero as total world population stabilized sometime after 2100 at just over 11 billion.

To put this projection in perspective, today's global TFR average is 3.3 children, with national variations ranging between 1.3 and 6.4 births per woman and a total world population of about 5.6 billion. For the year 2050, the U.N.'s "high" projection assumes a TFR of 2.60 children per woman and a total population of 11.9 billion. Should fertility remain constant at a TFR of 3.3, however, total population would be 16.1 billion by 2050. Neither of these high scenarios seems at all likely, however. Indeed the U.N.'s medium projection may even turn out to be on the high side.

The reason is that population growth rates and TFRs are declining nearly everywhere. Relatively speaking, fertility remains high in Africa, the South Asian subcontinent, and the Caribbean. These regions are growing as a share of the total world population and are also sending large streams of migrants to Europe, the United States, and less demographically vital areas. However, these movements are self-limiting since fertility is falling in the sending areas and migrants tend to be young persons, thus depleting the child-bearing bases there.

A Demographic Transition

Why is fertility declining? History shows that sustained economic development usually leads to smaller

family size in the long run. Consider what happened in Europe, for example, where commercial, agricultural, and industrial revolutions in the seventeenth and eighteenth centuries triggered sustained population growth. Once launched, this growth spurred continuous economic, social, and political transformations over the next two centuries. Gradual declines in mortality occurred through improvements in hygiene and nutrition. But fertility fell also, as income, urbanization, education, and health reached certain thresholds.

Generalized as a "demographic transition," this European experience of better living standards leading to smaller family size has been found to apply to the more recent experiences of Latin America, Asia, and Africa, which did not have their own population explosions until after World War II. In these later cases the transition has taken place much more rapidly, with public health programs and family planning playing key roles in lowering mortality and fertility. Rapid increases in female education have also played a major role. While it took Europe nearly a century to complete its transition, many Asian and Latin countries have gone from sustained growth to fertility plunge in one to two generations.

Decisions about family size are part of what economists call the "utility maximization" process. Children contribute to parental well-being in many ways, but also compete for time, attention, and household

Total fertility rates by region, 1994.

Geographic location	Total fertility rate
Western Europe	1.5
Japan, Australia, New Zealand	1.6
Eastern Europe	1.7
China	2.0
North America	2.0
South America	3.1
East/Southeast Asia	3.2
Central America	3.4
South Asia	4.2
West/Central Asia	4.4
North Africa	4.5
Sub-Saharan Africa	6.4
World average	3.2

Source: Population Reference Bureau World Data Sheet, 1994.

Those who predict a population "birth dearth" look at the present below-replacement fertility levels in Europe and some Asian countries and predict national and even global extinction.

Many demographers on the other hand see the present very low European rates as a temporary phenomenon as many women postpone—but do not forego—child-bearing. The TFR in the United States seems to be stabilizing at around 2.0 children per woman. Many non-Western populations have a long way to go before even approaching replacement levels.

In any case, there is nothing automatic about either replacement or below-replacement fertility. Population trends depend on the reproductive decisions that individuals make in the context of all sorts of considerations including social mores and environmental economics.

resources. Economic development changes parental aspirations and values, increases the cost of children, and creates competing sources of parental utility. Fertility declines because couples, weighing all these factors, decide they want fewer children. Family planning programs work because they help couples reach goals that they set for themselves.

The widespread desire for smaller families does not mean that family planning programs are redundant. Some 40 percent of the decline in Third World fertility in recent decades is attributed to family planning, and the success of these programs may be responsible for

the "ideational" demographic transition that we are also seeing today—the global shift toward the small-family norm even in countries that have not enjoyed sustained economic and social growth.

Of course in countries that have experienced rapid economic growth, fertility arguably would have fallen sooner or later even without family planning programs. But sooner is much better than later. Asia's rapid fertility reduction has meant a "softer landing" for these economies and an ultimate world population several billion lower than otherwise might have been the case.

Population Theories

The notion that there is a correlation between higher living standards and lower birth rates suggests a logic to the demographic changes that have taken place over the last two centuries. Yet it requires a leap of faith to assume that in a situation of complete free choice, replacement-level fertility (the two-child family) will be the average procreation goal of all couples in the world for generations to come. Clearly this is a sweeping assumption about future human values and behavior.

Why do people have children at all? To the economic theory of fertility some analysts add that children provide a unique type of satisfaction, irreplaceable by other goods or services, explaining why most people continue to want them, albeit in greater or smaller numbers, regardless of changing economic and social values.

Are humans like other creatures whom nature has endowed with reproductive "strategies"? Sociobiologists contrast the "K" reproductive strategy, under which a species reproduces as fast as possible to ensure that at least a few of the offspring live to maturity, with an "r" strategy, under which only a small number of offspring are produced and then carefully nurtured so as to arrive at maturity in better condition. Which strategy is more appropriate depends on the species and on environmental conditions. It also appears that some species show an ability to switch from one strategy to another as environmental conditions change.

It is tempting to apply this idea to the human situation. But are fertility goals really genetically encoded? What seems more likely is that societies have usually adopted fertility norms aimed at ensuring survival of the clan or group, which are then communicated to the individual and become as powerful as

genetic drives. The presumed innate feminine “desire” for children may well represent only social conditioning of young women by societies anxious to ensure their own long-run survival.

Latter-day social concerns may have nudged fertility norms in the opposite direction. Several decades of intense public discussions over the population threat to “spaceship Earth” may have left their mark, so that microdemographic behavior is conforming to perceptions about macro-environmental consequences. Perhaps we have for the last several decades been pushing our young men and women to something akin to an “r” strategy of reproduction.

Future Policy

The U.N. goal of stabilization and zero population growth by the end of the next century may turn out to be the final stage in a demographic transition set in motion several centuries ago. But however difficult to quarrel with, it is a goal that could change—and not necessarily with dire consequences.

Suppose, for example, that through a new wave of technological advances the world does succeed in coming to grips with the ecological and environmental problems that threaten it. Couples might perceive their surrounding environment as more benign, even supportive. A new demographic growth cycle might well emerge, taking the world to a higher population total, consistent with the improved global economic and ecological carrying capacity.

This homeostatic view of demographic, economic, and environmental interaction assumes feedback linkages and a long-run, self-regulating mechanism that influences individual behavior via social perceptions and institutions. The very long-run population equilibrium of the globe may well be several times the presently projected zero population growth total of some 11 to 12 billion, although that seems inconceivable now.

Suppose, on the other hand, that the “birth dearth” model (see sidebar) turns out to be right and fertility falls below replacement and threatens to stay there. Can policy raise the desired and actual level of fertility? Science fiction writers foresee a future society with well-paid professional “breeders” ensuring the continuation of the species. A variety of less-colorful measures has been used in Europe to encourage child-bearing by middle-class working women—paid

maternity (and paternity) leaves, easier access to child-care, and even outright baby bonuses.

The results of these pronatalist policies, however, are sobering. Only modest marginal effects on completed family size can be detected. It appears easier for policy to lower fertility than to raise it. But, in all honesty, we cannot be sure of what a vigorous, comprehensive, and sustained pronatalist policy could achieve, because one has yet to be developed and implemented under favorable conditions.

Is there any sure policy bet? What we do know is that effective family planning policy measures can help couples attain their desired fertility goals, since this is the way things have worked thus far. Indeed continued active promotion of family planning is built into U.N. projections of the world's TFR falling to replacement levels by 2030 or thereabout.

Such programs will help couples reach their ideal family sizes sooner and more easily. Without them, stabilization may well occur anyway, but will take longer and the ultimate world population will be considerably larger.

Other social factors are in flux now, also, that policy may influence. The first egalitarian gender system may be emerging, and couples now have procreative options not available before. The human species is on the verge of gaining a humane, voluntary control of its own demographic destiny for the first time in its history. The future population of the globe will be what couples decide it should be—an important factor often overlooked in the population debate.

Warren C. Robinson is a professor emeritus of the Pennsylvania State University and a Washington, D.C.-based economic consultant. This article is based on a lecture that he gave as part of RFF's noontime seminar series.

Further Reading

John B. Casterline, Ronald D. Lee, and Karen Foote (eds.), *Fertility in the United States*. (New York: The Population Council, 1997).

Wolfgang Lutz (ed.), *Future Demographic Trends in Europe and North America*. (New York: Academic Press, 1991).

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The Pollution Prevention Puzzle

Which Policies Will Unlock the Profits?

by James Boyd

Is American business passing up opportunities to profit by operating clean and green? RFF case studies suggest that the answer is more complex than a simple yes or no. One thing that is clear is that corporate pollution prevention is more likely to flourish if environmental policies allow firms the flexibility to be innovative.

The concept of pollution prevention, coined “P2,” is emblematic of a new, proactive environmental mindset that promises more “sustainable” corporate management. By targeting the causes, rather than the consequences, of polluting activity, the idea is to eliminate pollutants at their sources—where and when they occur in manufacturing and other production processes—and thereby eliminate the need to treat or dispose of those pollutants later.

The concept has given rise to talk of “win-win” opportunities in which innovation and new ways of thinking will lead to waste reduction and, at the same time, make firms money by reducing costs or stimulating new products. Cast as both a corporate and an environmental benefit, the promise of pollution prevention has raised hopes that the environmental regulatory process will become less adversarial. The concept has also created optimism about the private sector’s ability to come up with low-cost solutions to its environmental problems, the premise being that prevention costs less than the cure.

Unfortunately, the vision of pollution prevention as a set of win-win opportunities is somewhat at odds with actual corporate experience. While anecdotal evidence from a number of studies suggests that such opportunities exist and that many firms have pursued them, proponents say the pace of P2 is slow and that the private sector is somehow failing to see the opportunities in front of it.

Two Theories

Why isn’t more pollution prevention observed? Consider two polar (and thus simplified) explanations. Theory 1 holds that organizational failures or barriers stand in the way of P2 initiatives. Examples include accounting methods that do not adequately quantify the financial benefits of a given P2 opportunity, inappropriate management incentive schemes, excessively high hurdle rates for capital investment, and communication problems—the so-called “green wall” that separates environment, health, and safety managers from their corporate financial counterparts. Among those who subscribe to Theory 1, the overall sentiment is that money could be made from P2 if only the corporate sector would put its house in order.

Theory 2 holds that P2 fails to occur because it is not actually in the corporate sector’s financial self-interest. This theory takes issue with the win-win perspective itself. According to this school of thought, there is nothing particularly wrong with the private sector’s accounting, communication, and financial procedures. Instead, it is simply a matter of pollution prevention offering fewer benefits than costs.

From a policy standpoint, these theories matter. The idea that pollution prevention can save firms money—but that firms nevertheless neglect P2 opportunities—calls into question the desirability of regulatory flexibility. If firms cannot be counted on to make environmental improvements that save them money

(Theory 1), isn't it reasonable to conclude that command-and-control regulations, mandated environmental accounting, and publicly reported P2 planning should be relied on to get the job done? This is tough medicine. But for the patient's own good.

For their part, corporate environmental and financial managers tend to be more skeptical of pollution prevention's profitability, citing the costliness of the technical and managerial innovations necessary to bring about P2 (Theory 2). A set of costs that is particularly apparent to this group arises from regulatory barriers that reduce the financial incentive to change production processes or introduce new products. In this view, pollution prevention's profitability—or lack thereof—depends on government policy. The prescription is for regulations that will free firms to be more innovative.

RFF Case Studies

Very little is actually known about how and why—in the real world—firms decide whether or not to pursue pollution prevention opportunities. To find out more, RFF conducted case studies of P2-related decisions made at several U.S. chemical firms, which were selected using the following criteria.

First, the pollution prevention opportunity had to be promising enough to be evaluated by a firm itself. More specifically, evaluation of the P2 opportunity had to involve not only technical but financial analysis—perhaps the most crucial component of corporate decisionmaking. After all, even if a pollution prevention technology passes muster in engineering labs or environment, health, and safety meetings, it will not succeed in a practical sense unless it survives a firm's strategic analysis and capital budgeting process.

Second, the P2 opportunity ultimately had to be rejected by managers or be unsuccessful in some other way. Unsuccessful P2 initiatives were of the greatest interest because they allowed us to focus on corporate rationales for *not* making P2 investments.

The cases that RFF studied opened a window on business decisionmaking generally and environmental decisionmaking specifically. In terms of conclusions, however, the small set of data must be drawn upon with caution. In fact, one of the main lessons to be learned is that most decisionmaking issues that arise are highly specific to the given firm and investment. With this caveat in mind, we turn to some of the

questions that the case studies addressed and tentatively answered.

Does the corporate decisionmaking process adequately capture the environmental benefits of a P2 opportunity? Being able to identify and then quantify the environmental benefits of investing in pollution prevention is a real challenge. In evaluating how successful a firm is in meeting this challenge, it is important to ask two distinct questions. First, to what extent were environmental benefits and costs *quantified*? Second, even if they were not quantified, did the firm give them an appropriate *qualitative weight* when making its decisions?

The financial analyses in the cases we studied included relatively little economic quantification of environmental benefits and costs. In general, dollar values were not attached to preventing emissions or pollution liabilities.

How is this lack of environmental accounting data to be interpreted? First, it should be pointed out that while the economic values of preventing pollution were not quantified, the technical benefits to be expected were analyzed extensively. In all of the cases, for instance, the technical merits of preventing emissions were quantified in a variety of ways. The only step that was missing was a translation of the possible technical benefits of P2 into financial ones. In fact, one of the cases revealed a managerial decision to explicitly avoid trying to quantify the environmental benefits during its financial evaluation.

Why was this step not taken? The best explanation is that it is simply too difficult to arrive at economic values with any precision when it comes to environmental benefits. When a firm is estimating conventional costs, such as that of a new piece of capital equipment, something as simple and available as the market price of the item can be used. No analogous list of prices or costs exists that can be used to assign a dollar value to reduced environmental emissions.

Given the lack of quantified environmental benefits, do the cases then suggest that corporate decisionmakers give inadequate consideration to P2 opportunities? The answer is no. Although not quantified, environmental benefits were given significant *qualitative* value and were often key drivers in the decisionmaking process. That is, they were among the top three or four motivations for undertaking a given project, as indicated in the business analyses that managers presented to their CEOs. In general, high-

level corporate decisions are rarely, if ever, made on the basis of a purely numerical analysis.

Are firms missing win-win pollution prevention opportunities? RFF conducted the case studies largely to get a better empirical understanding of corporate rationales for rejecting or delaying identifiable pollution prevention opportunities. The investment decisions that we studied appeared to have been financially reasonable, based on our analysis of them using basic concepts from business and financial theory.

The evidence contradicted the view that firms suffer from an inability to appreciate cost-saving P2 investments. Instead, it appeared that the investments themselves were financially unattractive because of significant unresolved technical difficulties, uncertain market conditions, and, in some cases, regulatory barriers or insufficient emissions enforcement. In many cases, the mystery of why a firm did not pursue a P2 opportunity could be resolved simply by taking a closer look at the costs, benefits, and risks involved.

This conclusion implies nothing about the *social* desirability of the decisions that the firms made. Reasonable persons will differ as to how much pollution prevention is the right amount. But the case studies do imply that there may be fewer low-cost, win-win P2 opportunities than many hope.

Barriers and Benchmarks

The cases challenge the belief that organizational failures are to blame for missed or delayed P2 opportunities. Nevertheless, firms do face significant informational problems when they evaluate new investment opportunities. In fact, imperfect information explains a great deal about the ways in which firms analyze and make investments. This point is best made by distinguishing between a firm's methods for dealing with imperfect information and organizational failures.

The term "organization failure" connotes the existence of a correctable management strategy, accounting procedure, or financial methodology that leads a firm to make less than optimal decisions. The firms that we studied, however, exhibited few of these correctable types of flaws. Instead, the cases depicted managers struggling with much more formidable challenges to investment decisionmaking—challenges that are pervasive and not limited to P2.

Consider, for example, what is known as the "hur-

dle rate"—that is, the rate of return that a new project must be expected to exceed before capital will be directed toward it. In general, a firm will not invest in a project whose rate of return falls short of the hurdle rate, even if the rate of return is a positive one.

This common business practice can be a source of frustration to advocates of pollution prevention, who see a positive rate of return as evidence of profitability. But a project's rate of return is meaningful only in light of its cost of capital. Moreover, the cost of capital is not typically easy to measure, since it is intimately related to project risk. Thus, the implication of a particular rate of return figure for decisionmaking requires detailed knowledge of factors contributing to risk. No single rate of return "hurdle" can be used as a benchmark for judging an investment's profitability.

Capital rationing—whereby a business unit faces a fixed, annual investment limit—was also evident in the cases. Capital rationing is commonly used to prioritize investments and discipline managers when a firm's information about possible projects is imperfect. While such rationing may mean that certain P2 opportunities are passed over, it does not follow that environmental investments are any more disadvantaged than other investment opportunities.

Policy Incentives

The best overall level of pollution prevention undertaken by the corporate sector is a question left to a different study. Analysis of the cases that we looked at, however, supports the soundness with which managers weighed the benefits, costs, and risks of the pollution prevention investments that they evaluated. Rather than organizational barriers or myopia, the cases reveal a set of complex but ultimately prosaic motivations for the decisions that the business managers made. Appreciation of those motivations is important because it can help guide public- and private-sector efforts to improve corporate America's pollution prevention performance.

First, the cases reveal regulatory barriers to pollution prevention of varying significance. The desire to experiment with different treatment, disposal, and transport options—experiments at the heart of P2 innovation—is often thwarted by rigid media- and technology-specific regulations. Given the difficulties of environmental enforcement, the rigidity of many regulations may be understandable. Nevertheless,

efforts to promote flexibility should be embraced to foster the corporate sector's ability to develop P2 innovations.

Second, some of the P2 opportunities that we studied grew out of efforts to retrofit obsolete production facilities, the costs of which are significant. It may well be that such improvement projects offer the best win-win opportunities. Firms benefit financially from the efficiencies of facility upgrades while the environment benefits from the cleaner technologies employed in more modern equipment.

Firms engaging in the total redesign of products and processes, however, are best motivated by regulations that favor inherently speculative types of innovation. Command-and-control regulations that mandate particular technologies are poorly suited for this task. Regulations that maintain meaningful performance standards but that also provide firms with technological flexibility and longer time-horizons for compliance are much more likely to lead to dramatic P2 innovations.

Third, the financial evaluation procedures that the firms used to assess P2 opportunities underscore the need for improved "green" accounting procedures, including better data collection, estimation, and evaluation techniques. But how can firms best be motivated to improve the collection and use of environmental information?

The key is a climate in which firms themselves value and demand such information. Again, regulatory flexibility is the prescription. Better information helps

firms only if they have the flexibility to act on—and benefit from—better information. Expanding the technological options open to firms increases the value of information relating to those options.

In the end, regulation that allows for a wide variety of innovative solutions is likely to be the best way to induce firms to invest in better environmental information and decisionmaking.


James Boyd is a fellow in the Energy and Natural Resources Division.



To download a copy of Boyd's related report "Searching for the Profit in Pollution Prevention: Case Studies in the Evaluation of Environmental Opportunities," (RFF Discussion Paper 98-30) access http://www.rff.org/disc_papers/1998.htm. Copies may also be ordered by mail; see page 22.

Further Reading

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Long-Term Stewardship and the Nuclear Weapons Complex

The Challenge Ahead

by Katherine N. Probst

No matter how much money is spent on cleanup, some hazards will remain at most of the nation's former nuclear weapons production sites. To protect human health and the environment will require long-term stewardship—a program to ensure protection of public health and the environment in the decades to come.

Getting the U.S. Department of Energy to focus on environmental cleanup has been a long and difficult undertaking. For many years, the department denied that it was responsible for complying with the major environmental laws, notably those governing management of hazardous wastes and mixed wastes (that is, those that are both hazardous and radioactive) and the cleanup of contaminated sites.

A landmark court case decided in 1984, *LEAF v. Hodel*, changed that. Now, almost fifteen years later, one-third of DOE's budget goes to its Office of Environmental Management (EM). As noted in DOE's September 1997 Strategic Plan, environmental quality has become one of the department's four basic missions, along with energy security, national security, and science leadership. This environmental focus would have been unthinkable just ten years ago.

The charge to DOE's environmental management program is enormous: cleaning up the contamination, wastes, nuclear materials, and contaminated structures resulting from decades of nuclear weapons production at over 100 sites in thirty states around the country. At approximately \$6 billion, the annual budget for DOE's environmental management program is also enormous—twice as much as the total estimated public and private expenditures on nonfederal Superfund sites, and almost as large as the total annual operating

budget of the U.S. Environmental Protection Agency.

Much of EM's budget goes to activities few would define as "environmental management." For example, EM estimates that in recent years as much as 50 percent of its budget has gone to what are referred to as the "mortgage" costs of ensuring security and maintaining local infrastructure at the sites in the weapons complex. Some funds also go to managing excess nuclear materials stored at DOE sites.

Still, substantial sums of money are being spent on cleanup. Since 1989, DOE has spent approximately \$20 billion on cleanup tasks, and the end is nowhere in sight. Most experts believe that it will take decades before the department completes cleanup activities at all the sites in the weapons complex. The total price tag has been estimated to be almost \$150 billion.

Describing the EM program as a "cleanup" program is something of a misnomer, though. No matter how much money is spent, some hazards will remain at over two-thirds of the sites. The lack of proven technologies to address radioactive and other forms of contamination, widespread soil and groundwater contamination, as well as the fact that many DOE sites will continue to be home to waste storage and disposal facilities, means that hazards will remain for hundreds, if not thousands, of years. DOE will not be able to walk away from these sites, nor from its past cont-

amination problems. A program of long-term stewardship will be needed.

Long-Term Stewardship

What is long-term stewardship? Broadly speaking, the term refers to the physical controls, institutions, information, and strategies needed to limit human exposure to, and environmental contamination from, remaining site hazards after cleanup of the weapons complex is completed.

Among the likely elements of such a program are: institutional controls to prevent inappropriate future land and groundwater use; maintenance of waste disposal facilities; preservation of institutional memory and communication mechanisms to keep future populations informed of site hazards; and long-term site surveillance and monitoring.

We need to address the issue of long-term stewardship now. Decisions made today about what types of environmental risks to address, how much to clean up, and how and where to dispose of it all affect the distribution and degree of hazards that remain at DOE sites. Today's choices will determine the kinds of long-term governmental responsibilities that will be needed to protect human health and the environment in the future—as well as the costs imposed on our children and grandchildren. Already there are twenty-eight sites where EM has completed its planned cleanup actions that require some kind of stewardship activities. Fifty-one additional sites are expected to fall into this category in the coming decades.

Perhaps most importantly, stewardship needs to be addressed now because the need for post-cleanup care has major institutional and financial implications. These implications are not adequately addressed either in DOE's current institutional structure or in its most recent budget request.

Addressing the challenge of long-term stewardship raises a number of difficult questions, given the political context surrounding the weapons complex and the long-lived nature of the hazards involved. What organization should be charged with ensuring protection at these sites? Is federal legislation needed to create a strong stewardship mandate? And, perhaps most difficult, how can the long-term financial security of the organization charged with stewardship be ensured? Providing answers to these questions is the

next major challenge facing the department's environmental management program.

Developing a Program

Experts agree that long-term stewardship will be needed at the weapons complex sites. But agreement among experts is not the same as action.

Defining the mission of a long-term stewardship program is in many ways a simple task: To take those actions necessary to protect human health and the environment from hazards that remain at sites in the weapons complex after "cleanup" (engineering solutions) have been implemented. Actually *creating* an enduring stewardship program is a much more difficult charge.

The most important next step is to stimulate a public dialogue as part of the process of developing a framework for a successful stewardship program. It is critical that participants include DOE and the full panoply of stakeholders—EPA, state agencies, local citizens, tribal nations, local governments, environmental groups, and DOE contractors. Absent such a dialogue, there will be no support for the difficult steps ahead.

Figuring out just what stewardship means in a given context, what organization should implement needed activities, and what organization should conduct external oversight are likely to be extremely controversial issues. The most daunting challenge will be to ensure that whatever institution is charged with stewardship responsibilities has the bureaucratic, political, and financial wherewithal to successfully implement them.

DOE is likely to have a role implementing stewardship activities. For that reason the department needs to show leadership on this issue now and start to put in place information and strategies that provide a sound base for developing a stewardship program. Currently, DOE does fund some external research on what will be needed (including RFF's own work). But internal research and analysis are confined to a few relatively small offices within EM.

One of the major stumbling blocks to a frank debate about stewardship is likely to be money. Right now, DOE's stewardship liabilities are not identified as such, even though everyone knows they exist. One of the reasons why these liabilities have not been identified is almost certainly the desire to show that the costs

Question Markers

ROBERT DEL TREDICI



A granite block stands in the Palos Park Forest Preserve, twenty miles from Chicago. Erected in 1978, it marks the burial site of radioactive materials that include wastes from the world's first nuclear reactor, built by Enrico Fermi for the Manhattan Project in 1942. While the tombstone cautions "DO NOT

DIG," its inscription also unequivocally assures park visitors that the site poses no danger to them.

Such markers could eventually appear at sites across the country, for they are one of the main ways that DOE has to warn people not to disturb hazardous and radioactive wastes and materials that will remain toxic for centuries to come. But would they adequately communicate the dangers that remained at the sites they marked? Or do such monuments present an "attractive nuisance" more than they do a deterrent?

of the EM program are decreasing over time. A critical next step is to estimate the institutional and financial costs of long-term stewardship for each of the more than seventy-nine sites that will require such a program, and to integrate planning and budgeting for stewardship into the department's internal processes. Focusing on these responsibilities will require that DOE come clean about its long-term environmental liabilities.

A Legislative Mandate

While there is much talk about completing cleanup at DOE sites by 2006, it is clear that the need for stewardship will extend well into the distant future. Congress and the agencies that regulate DOE (EPA, other federal agencies, and states) must begin to address the institutional and financial implications of this fact.

One obvious way to create a stewardship mandate would be to enact federal legislation. Specifically, Congress would need to outline the stewardship mission at DOE sites, setting out the various roles and responsibilities of the various organizations (such as DOE, other federal agencies, and state agencies, among others) to be charged with implementing stewardship functions.

A legislative mandate for stewardship is needed for three reasons. First, it is unlikely that a coherent stew-

ardship program will be created otherwise. Second, clear mechanisms of external accountability are essential. Third, only some kind of legislative driver can ensure that the required financial resources are dedicated to stewardship functions. Indeed, absent substantive legislation, we can almost be certain that whatever mission or organizational structure is created for stewardship will not endure and will not be successful.

Precedents exist for creating a regulatory structure for what is often referred to as post-closure care. The need to create a program to protect human health and the environment from long-lasting hazards is not unique to DOE sites and facilities. A number of federal regulatory programs already contain elements of stewardship. These include provisions for post-closure care at hazardous waste land disposal facilities under the Resource Conservation and Recovery Act and decommissioned commercial nuclear power plants under the Atomic Energy Act.

Typically, the stewardship functions (although they are not referred to as such) consist of requirements to ensure protection after a facility has ceased operation or after remediation at a site is completed.

In terms of opportunity, the Superfund reauthorization debate may well provide a good one for creating a legislative stewardship mandate. After all, stewardship activities will be required at many Superfund sites and at facilities under the purview of other federal agencies, such as the departments of defense, agriculture, and interior.

The most appropriate policy response may be to create a national stewardship mandate for all contaminated sites under the Superfund framework. One of the most politically charged issues in the reauthorization debate has been the role of land use in selecting site cleanups and the use, and enforcement, of institutional controls. Almost all of the Superfund bills introduced in this Congress include some kind of language addressing these issues. Moreover, because the largest and most expensive DOE sites are on the EPA National Priorities List, they would be subject to Superfund requirements should the act be reauthorized.

Katherine N. Probst is a senior fellow in the Center for Risk Management. This article is based on an RFF report she authored with Michael McGovern, a former research associate in the center. The report should be available in June, and can be ordered by calling 410-516-6955.



On Prophecies of Environmental Doom

by Paul R. Portney and Wallace E. Oates

No one can fault *The Economist* for being boring. Its deliberately provocative article, "Environmental Scars: Plenty of Gloom" (December 20, 1997) is but one recent example of its ability to stir up a tempest—in this case among certain members of the environmental community.

The article starts in on Malthus and continues on up to the present day to indict members of the Club of Rome and other contemporary prophets of environmental collapse, proclaiming that "Forecasters of scarcity and doom are not only invariably wrong, they think that being wrong proves them right."

The implication is that we should disregard the "environmental scares" with which we are seemingly continually assaulted. Many environmentalists have taken deep offense and are fighting back; indeed, a symposium is being convened especially to respond to *The Economist's* proclamation. In this article we present a much-abridged version of the contribution that we have been invited to make.

No doubt many criticisms will be raised. It seems to us, however, that more than a germ of truth exists in what *The Economist* has to say. As a matter of fact, the prophets of environmental doom do have a very bad record. Their forecasts have, as *The Economist* says, been "invariably wrong."

The reasons are several. One is a simple misunderstanding of the way a market system works in the face of growing scarcity of exhaustible resources, including fuels and other minerals. Organized markets function to conserve such resources. As their supplies dwindle relative to demand, their prices rise. These price hikes set in motion powerful incentives to economize—to recycle or rehabilitate spent resources, to find substitutes for them, and finally to discover new, less-expensive ways to extract and/or produce them. One basic way in which resources in finite physical supply are "stretched" is through the devel-

opment and use of new technologies. A forthcoming book from RFF edited by David Simpson, for example, looks at technological changes that have resulted in *reduced* real prices over time for oil and gas, coal, copper, and timber.

Not all resources and environmental goods, however, enjoy such market protection. Yet even with regard to these resources, the most dire predictions have failed to materialize, in part because of the evolution of a variety of institutions for their management. Societies through the ages have developed techniques, some quite ingenious and fascinating, to regulate access to such common-property resources as grazing lands, fisheries, and water. Most recently, we find agreements such as the Montreal Protocol reached to limit emissions of various chemicals that deplete stratospheric ozone. Nevertheless, certain common-property problems bedevil contemporary society: free access to the world's fisheries and rain forests, for example, has put these resources under tremendous pressure.

Implicit in this last point is an important message: sometimes part of the sky is falling (or being thinned out by harmful substances). *The Economist* erred, we believe, in not acknowledging that doom-sayers have mobilized political forces for needed environmental protection. The principal reason that concentrations of air pollutants have fallen in virtually every metropolitan area over the last twenty-five years was the enactment of federal air pollution controls in 1970. These controls were prompted in large part by the dire warnings of environmentalists (and some economists) who foresaw the likely effects of unchecked industrial growth. Similar warnings and subsequent measures have reversed the deterioration of many streams, rivers, lakes, and estuaries, and have awakened us to the folly of the careless disposal of hazardous wastes.

The role that Chicken Little plays pre-

sents us with a troubling dilemma, however. On the one hand, unjustified cries of alarm can lead to unneeded, costly measures, as *The Economist* points out. What's more, such cries can lead to public weariness and indifference. If the sky is forever said to be falling, real—not just imagined—problems may go unrecognized. On the other hand, our political system seems to require a crisis mode to set forces in motion. We might do well to think more about how our institutions for policymaking can be made to respond to less startling, but more realistic, claims.

At any rate, it seems clear that plenty of challenging environmental problems need to be addressed. No matter how we read *The Economist*, surely no grounds exist for concluding that we can simply forget about existing environmental threats. The challenge is to focus our attention on real (not imagined) problems, giving them their proper priority, and through careful analysis to find effective ways to resolve them.

Paul R. Portney is RFF's president. Wallace E. Oates is an RFF university fellow.

RFF Wednesday Seminar Series

Come join us at RFF's noontime seminars where staff and invited guests discuss a wide range of research and public policy issues relating to environmental economics. Seminars are held from September through June in the seventh floor conference room. Presentations begin at 12:30 and end at 1:30 p.m. and you are welcome to bring your lunch. Registration is not required, but space is limited.

Descriptions of upcoming seminars are available (free) each month by e-mail. To subscribe to RFF's electronic mailing list for seminar announcements, send the message *subscribe to:*

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Economy, Energy, Environment

Catherine G. Abbott is president and chief executive officer of Columbia Gas Transmission and a longtime observer of the U.S. energy industry. Elected to RFF's board of directors in April 1997, she spoke recently with J. W. Anderson, RFF's journalist in residence.

RFF: How do you see RFF in terms of its capacity to contribute to policymaking?

Abbott: What I think is distinctive about Resources for the Future is that it makes the attempt, as much as is humanly possible, to bring the skills of social science analysis, particularly microeconomic analysis, to very knotty and contentious, often highly politicized, public policy problems.

RFF brings with that a credibility across a wide variety of audiences. I think that stems from the real integrity and seriousness of purpose with which the staff approaches these problems. That distinctiveness allows RFF to play an unusual role in the public policy debate because most organizations, even research organizations, are viewed as having axes to grind.

The organization is very clear about what problems it cannot speak to. On global warming, for example, it is not our comparative advantage to give you an opinion about the science of global warming. But we can tell you whether there are more or less efficient and equitable ways to deal with certain issues.

RFF: What do you think ought to be RFF's priorities in dealing with global warming?

Abbott: I think two things would be helpful. One is a clear assessment of what was achieved and not achieved at Kyoto and what the paths might be for improving upon the basic set of agreements that were arrived at in Kyoto.

We are all aware of the issues of the fast-growing developing nation economies,

India and China in particular. If they are outside the envelope of emissions reductions that can be counted and monitored, there is just a giant efficiency loss to the entire world economy. Making that clear, I think, in nonpoliticized terms could really advance the debate.

Second, again within the framework of Kyoto, RFF can ask: Are there better ways to deal with the information uncertainty



problem that could again lead you to more efficient uses of the resources?

It is very important to continue to look for ways to use market mechanisms to effectuate the reductions. We have seen the tremendous efficiency gains available with SO₂ trading allowances compared with what people thought it would cost the economy. Continuing to communicate that set of messages, I think, is very important.

RFF: What do you think will happen in energy markets over the next decade?

Abbott: Starting with the United States, you have a tremendous push toward customer choice. Customer choice has the potential to fundamentally restructure the electricity production system. That in turn could have a very large impact on the traditional mechanisms that we have used to address environmental issues, particularly those related to SO₂ and NO_x and increasingly carbon dioxide, because if a customer has a choice of options, then the supplier no longer can simply pass through the costs of complying with environmental regulations. And so the economic forces addressed by the various issues are being fundamentally changed in ways not yet fully understandable.

Electric utility restructuring also makes it far more difficult to effectuate tax approaches to issues such as reducing carbon emissions—because who will be the tax collector? That was one of the real downfalls in the whole approach to taxing energy consumption. Who is the IRS equivalent? That turns out to be a very knotty and difficult implementation problem and becomes more challenging with a more distributed energy economy, particularly on the electricity side.

I think you are going to see a lot more locally generated, site-specific-generated electricity. You are going to see a lot more end-use devices to shave peaks in periods of usage and get value associated with shaving peaks. That is another form, in effect, of managing the demand curve in ways that we have not seen before.

I suspect that current elasticity models overstate energy demand increases with

the growth of the economy, because there will be far more rewards to reducing at least on-peak energy consumption than we have seen historically. Just as some mistakes were made during the 1970s oil crisis, understating significantly the demand elasticity of energy consumption, I think there may be a structural change that could significantly affect how big the problem might be. RFF has done some nice work on the electricity system, by the way.

When you speak of world markets, the issues are somewhat different. I think you see a tremendous issue for the global economy in places where coal is readily available and cheap and where, for economic growth reasons, countries have not elected to impose significant emissions control technologies. That is a greater threat to the world ecology. Finding market mechanisms to distribute the control technologies and making controls more efficient across the world needs to be a major focus, I think, of international research efforts.

Related to that, I am really excited about some of the biodiversity research that RFF is engaged in, and the collaboration with the Nature Conservancy. I think the pace of economic development, the immense power of the market model, and the expansion of communications that makes a large number of people want a Western lifestyle create an impetus to destroy a lot of critical habitat.

Were there some way to even out preservation mechanisms or burdens across national lines, you might get a very different answer than you are going to get with so much of that development and environmental protection being in the hands of local political leadership under a very different set of economic conditions and challenges than we face in the United States.

RFF: Are we going to have to change what we think of as American lifestyles to reconcile this growth with the environmental

values that you are speaking of—preservation of biodiversity?

Abbott: That has been a question in the environmental movement for a long time. What I am drawn to about the work of both Resources for the Future and the Nature Conservancy is the attempt to take a market economy and achieve environmental goals within that economy. That is not to say that individuals might not decide to go for a simpler lifestyle as a matter of ethical choice or moral persuasion. But I find that the element of personal choice imbedded in the U.S. model is very attractive.

I do think the kind of lifestyle you choose as a personal or ethical matter, or what a religious organization might take on as an ethical or moral matter—those are fundamental issues people need to wrestle with and make part of the civic debate, if you will. But I am much more comfortable leaving that to individual choice as opposed to government.

RFF: The Clinton administration is putting great emphasis on technology as a means of accomplishing things on its agenda, particularly reducing carbon dioxide emissions. How likely is it that technological advances are going to create reductions in emissions without other changes in the energy economy?

Abbott: I am not an expert on technological progress, although I did have a chance to observe the whole synthetic fuels effort.

I think one of the things we have learned as a part of the Energy Department's and the Synthetic Fuels Corporation's efforts is that governments just are not very smart at selecting technologies. People can be marvelously inventive if there is money to be made from government support or directives.

There certainly are places where there are market failures and, thoughtfully con-

sidered, those are places where I think you need to substitute government intervention. The key is looking for ways to get innovation going, rather than trying to mandate the innovation.

RFF: So the job for the economists at RFF is to give advice on what might work best in a market economy?

Abbott: Yes, I think that is right. Another thing that intrigues me is what other companies are doing. At BP, for example, they are trying to link their brand identity with an environmentally responsible approach. They are trying to distinguish themselves from their competitors in the oil business by their actions on the environmental side. Sharing information about those solutions might have tremendous power. That is a kind of role modeling by private corporations who, for their own reasons, think that this is a smart thing to do.

Once there started to be lists of the twenty-five, fifty, and one hundred best places for women to work, some corporations started competing to get on those lists because they wanted to attract bright, competent, and diverse workforces. That is a market mechanism, if you will.

It is about brand identity and is a market mechanism. Those are powerful forces, particularly for companies involved in retail markets and mass markets where brand identity makes a big difference.

When the public shows its commitment to environmentally responsible behavior in a way that contributes to the corporate bottom line, then the market mechanism will create more environmental responsibility by private companies. ☺



INSIDE RFF

New fellow in QE

Jhih-Shyang Shih has joined the Quality of the Environment Division as RFF's newest fellow.

PATRICK DEASON PHOTOGRAPHY



Jhih-Shyang Shih

Using his background in operations research, econometrics, statistics, and simulation, Jhih-Shyang is studying the relationship between environmental regulation and manufacturing productivity as well as ways to disseminate new technologies, including ones that will reduce carbon emissions. Jhih-Shyang is also analyzing efforts to reduce ambient ozone in terms of costs and benefits and the uncertainties associated with their success or failure.

Jhih-Shyang has experience doing systems modeling to study risk management, surface water, air quality, and solid waste management. He has published papers in the *Journal of Water Resources Planning and Management* and the *European Journal of Operational Research*.

Before his appointment as a fellow, Jhih-Shyang worked as a consultant to RFF for two years. He continues as an

instructor at the Johns Hopkins University, where he received his Ph.D. in environmental systems.

Jhih-Shyang is the recipient of fellowships from the American Association for the Advancement of Science/EPA and Carnegie Mellon University, where he did postdoctoral training at the Department of Engineering and Public Policy and Graduate School of Industrial Administration.

He earned M.S. and B.S. degrees in environmental engineering from the National Cheng-Kung University in Taiwan. ☞

Two join RFF board

At its annual meeting last month, RFF's board of directors elected two new members. They are **John M. Deutch**, a former director of the Central Intelligence Agency and current professor of chemistry at the Massachusetts Institute of Technology, and **Mary A. Gade**, director of the Illinois Environmental Protection Agency.

Deutch served as CIA director from 1995 to 1996, and as deputy secretary and undersecretary of defense, respectively, in each of the years before that.

Beyond national security and international affairs, Deutch has concerned himself with issues involving energy and the environment and technological innovation and economic growth. In the 1970s, he held several senior positions at the Department of Energy, including that of



John M. Deutch

undersecretary and director of energy research. For his work at DOE and DoD, he received an array of honors for distinguished public service.

Deutch has also long been associated with MIT, serving as its dean of science and then as its provost in the 1980s. The author of hundreds of publications on subjects ranging from statistical mechanics and polymer chemistry to technology and public policy, he started his career as a postdoctoral fellow at the National Bureau of Standards in 1965. The following year he became an associate professor of chemistry—first at Princeton and then at MIT, where he continues to hold a full professorship today.

Over the course of three decades Deutch has served in various advisory capacities to the White House, the Senate, and the National Science Foundation on issues relating to science and technology and intelligence and national security. He served on RFF's board once before, from 1991 to 1993.

Deutch received his doctorate in physical chemistry and an undergraduate degree in chemical engineering from MIT. He earned a B.A. in history and economics from Amherst College.

Trained as a lawyer, Gade began working for U.S. EPA in 1978 as an assistant regional counsel in Chicago. Over the next thirteen years she held several senior positions with the federal agency before assuming directorship of the Illinois EPA in 1991. She has devoted much of her career to



Mary A. Gade

hazardous and solid waste management, including running the nation's largest Superfund program, for which she was associate division director from 1987 to 1989.

Since 1995, Gade has chaired a thirty-seven-state task force that is reviewing the science available on ozone and ozone precursor transport and is working to develop control strategies. As a tribute to her leadership of this "OTAG" group, Texas Governor George

Bush conferred on Gade the status of "honorary Texan." For the same service, Georgia Governor Zell Miller bestowed the title "Governor's Aide de Camp."

In addition to directing Illinois EPA, Gade consults for the World Bank and the Agency for International Development, extending the benefit of her expertise, for example, to a

hazardous waste management project in China and an environmental monitoring project in the Baltic republics.

Gade holds a J.D. from Washington University School

of Law. She earned a B.A. in environmental studies and Italian from the University of Wisconsin, where she graduated Phi Beta Kappa. ☰

Passings

RFF notes with regret the deaths of former board members **Lawrence E. Fouraker** and **Lauren K. Soth**.

A chairman

Fouraker served on RFF's board from 1987 to 1996 and was its chair from 1990 to 1993. In learning of his death this past December, RFF Vice President Edward F. Hand recalled that "Larry assumed the chairmanship at an important transitional time. He helped lay the foundation for an expanded research program, with deftness and wisdom. As a result, RFF now is on a solid footing both financially and intellectually."

Fouraker's academic career spanned four decades, beginning as an instructor at the University of Wyoming in 1945 and culminating as the dean of Harvard Business School from 1970 to 1980.

A board member

Soth, who died in February of this year, was editor of the editorial pages of *The Des Moines Register* and the *Des Moines Tribune* for twenty-one years. He made his name writing about agriculture and

agricultural economics.

In 1956 he won the Pulitzer Prize for his editorial inviting Soviet premier Nikita Krushchev to visit Iowa farms "to get the lowdown on raising high quality cattle, hogs, sheep, and chickens." Krushchev took him up on the invitation.

Soth served on RFF's board from 1964 to 1979.

A good friend

RFF lost a good friend when the economist **Mancur Olson** died suddenly of a heart attack in December. Olson had kept an office at RFF on and off over the years, particularly during the 1970s. On learning of his death, RFF President Paul R. Portney noted that Olson will be remembered, among many reasons, for two books that he wrote.

The first, *The Logic of Collective Action* (1965), may have had even more of an influence on political science, sociology, and law than on economics, Portney said. In that book, Olson argued that special interest groups—whether representing business, labor, or another distinct

constituency—are able to organize effectively to impose costs on the public to benefit themselves. This ability to advance their narrow interests at public expense persists, Olson maintained, even when the overall costs to society are greater than the benefits enjoyed by the "winners."



Mancur Olson

In 1982, Olson published *The Rise and Decline of Nations*. There he argued, in an extension of his earlier work, that the nations of the world that had grown the fastest since World War II were those that had had their special interest groups effectively wiped out by the war. Olson's contention was that

the demise of special interests improved the efficiency of the economies in which they had formerly operated.

In the United States, however, both unions and trade associations survived the war intact and, according to Olson, kept the economy operating at a less efficient level than was possible.

At the time of his death, Olson was teaching at the University of Maryland. He was also directing an ambitious project to help developing countries and newly emergent democracies cultivate free market economies and democratic governance so that they, too, could be fast-growing in the years ahead.

In summing up Olson's career, Portney remarked that "Mancur was an inspiration to researchers everywhere," having led the way to much important work in economics and the other social sciences. What he deserves to be remembered for most, Portney added, is for reminding us all "not to shirk large and difficult problems" as we carry out our own work. ☰

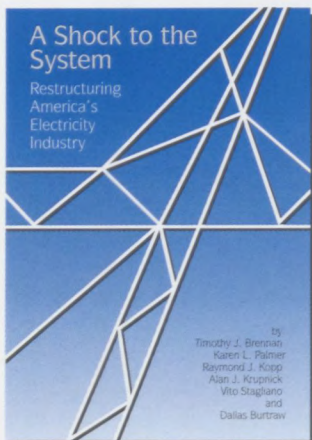
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J. Clarence Davies directs the Center for Risk Management at RFF. Jan Mazurek, formerly with CRM, is author of the forthcoming *Making Microchips: Policy, Globalization, and Economic Restructuring in the Semiconductor Industry* (MIT Press).

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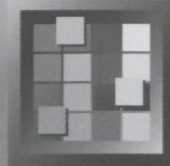
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DEVELOPMENT

Fisher awards enhanced

One good turn deserves another? Margaret Fisher's recent action on behalf of RFF is testament that the hopeful old adage is so.

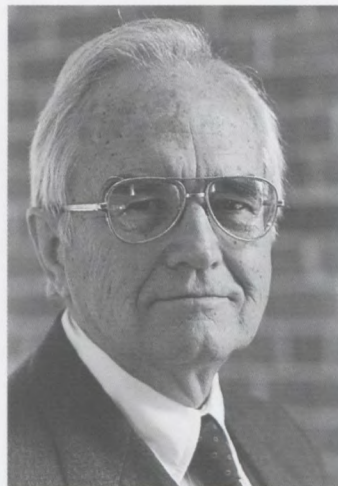
When RFF's fortieth anniversary rolled around in 1992, the organization's former board chairs gathered to mark the occasion and announce a new award program to honor **Joseph L. Fisher**, RFF's president from 1959 to 1974. Then, when the organization entered its forty-fifth year this past fall, Mrs. Fisher returned the favor. She presented RFF with a \$25,000 gift to help continue the program named after her late husband.

In making the gift, Mrs.

Fisher recalled how pleased Joe was to be associated with the dissertation awards program and that "he would be doubly pleased now to know that the awards continue and that young scholars are taking up the quest for wise resource use with this encouragement in his name."

Presented annually, the awards of \$12,000 each support selected graduate students in economics and policy studies during the final year of their dissertation research on issues related to the environment, natural resources, or energy.

One of RFF's major functions—in addition to performing research and policy analysis—is to ensure the future of environmental economics as a strong discipline.




Joseph L. Fisher

Through programs like the Joseph L. Fisher Dissertation Awards, RFF is able to mentor outstanding scholars and encourage achievement in higher education.

Take David Widawsky, for

example. A 1994 recipient, Widawsky used his Fisher Award to conduct research on rice yields and pesticide use in eastern China. He now has a position at the International Rice Research Institute in Manila, Philippines, assessing the economic impact of integrated pest management technologies.

He tells RFF, "the Joseph L. Fisher Fellowship was instrumental in helping me complete this research and launch my postdoctoral career, and I remain grateful for that opportunity."

For more information about the Fisher awards program, please call the Development Office (202-328-5016) or visit RFF's Web site (www.rff.org). 

Employer Matching Gift Programs

Ways to Make Your Gift Grow

Did you know? More than 6,000 small and medium-sized companies, large corporations, foundations, universities, and other not-for-profit organizations in the United States match their employee, retiree, or board member gifts to charitable organizations like RFF.

What are some of the benefits? RFF donors have the satisfaction of knowing that they are maximizing their support of RFF and financing long-term research in an extremely cost-effective manner. As one donor states:

Over the past few years, I've found the program to be an effective way to invest more resources in the great research and policy analysis work conducted at RFF.

—**Henry C. Finkenstaedt, Director, Enron Capital & Trade Resources Corp.**

How is such a match made? Contact your personnel or human resources office and fill out the appropriate matching gift form. Send the form with your contribution to RFF. We'll take care of the rest.

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Want to know more? Contact Jessica Blanton at 202-328-5096 or visit RFF's Web site at www.rff.org.

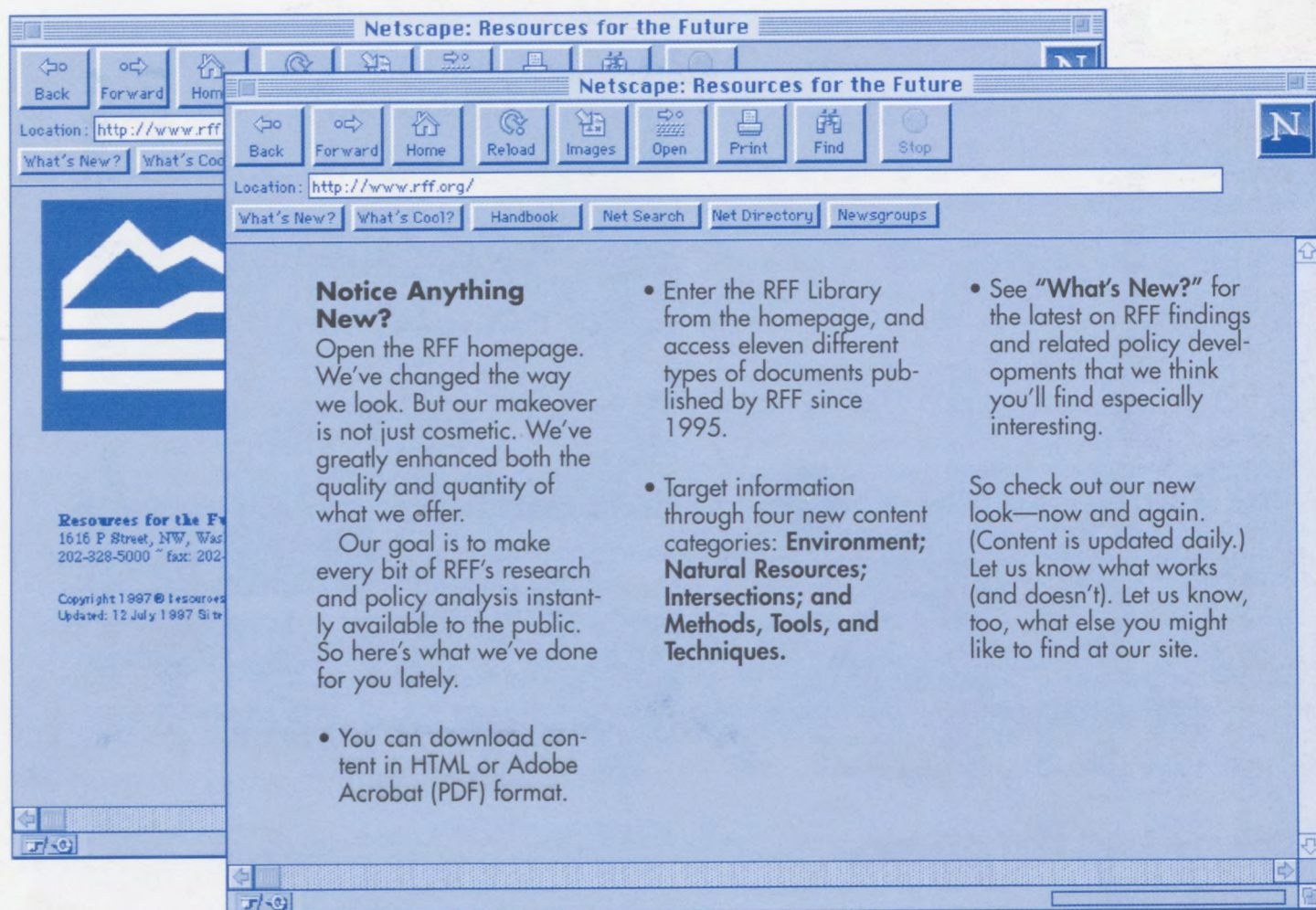
RFF extends a special thank you to the **W. Alton Jones Foundation** and the **John Merck Fund** for their support of a new project in RFF's Center for Risk Management.



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