

THE ENVIRONMENTAL ETHICS AND POLICY BOOK

Philosophy, Ecology, Economics

SECOND EDITION

Donald VanDeVeer □ Christine Pierce
North Carolina State University



Wadsworth Publishing Company
I(T)P® An International Thomson Publishing Company

Belmont, CA • Albany, NY • Bonn • Boston • Cincinnati • Detroit • Johannesburg • London • Madrid
Melbourne • Mexico City • New York • Paris • Singapore • Tokyo • Toronto • Washington

C. Ecofeminism 237

- 29. **Preview** 237
- 30. *Nature, Self, and Gender: Feminism, Environmental Philosophy, and the Critique of Rationalism*, Val Plumwood 241
- 31. *The Power and the Promise of Ecological Feminism* Karen J. Warren 257
- 32. *Development, Ecology, and Women*, Vandana Shiva 271
- 33. *How Feminist Is Ecofeminism?* Victoria Davion 278

V Economics, Ethics, and Ecology 286**A. Letting the Market Decide 286**

- 34. **Preview** 286
- 35. *The Ethical Basis of the Economic View of the Environment*, A. Myrick Freeman III 293
- 36. *At the Shrine of Our Lady of Fátima, or Why Political Questions Are Not All Economic*, Mark Sagoff 301

B. Cost–Benefit Analysis 310

- 37. **Preview** 310
- 38. *Cost–Benefit Analysis: An Ethical Critique*, Stephen Kelman 316
- 39. *Cost–Benefit Analysis Defended*, Herman B. Leonard and Richard J. Zeckhauser 322
- 40. **Sidelight:** *Cost–Benefit Analysis: Tool for All Seasons?* 326
- 41. *Earth in the Balance Sheet*, Robert Repetto 328
- 42. *Ethics, Science, and Environmental Regulation*, Donald A. Brown 335

C. From the Commons to Property 347

- 43. **Preview** 347
- 44. *The Tragedy of the Commons*, Garrett Hardin 352
- 45. *The Tragedy of Enclosure*, George Monbiot 360
- 46. *The Creation of Property*, John Locke 362
- 47. *Property Rights in Natural Resources*, Kristin Shrader-Fréchette 365
- 48. *Takings, Just Compensation, and the Environment*, Mark Sagoff 366
- 49. *The Rio Declaration* 376

D. Human Population and Pressure on “Resources” 379

- 50. **Preview** 379
- 51. *An Essay on the Principle of Population*, Thomas Robert Malthus 388

6. It is worth noting that moral and political philosophers and those who work in environmental ethics in particular, have some things to learn from economists in game theory, decision theory, and examination of slippery issues surrounding the notions of efficiency and utility that are of importance to virtually any environmental policy question. For example, the important idea of choosing behind a veil of ignorance, one that has been put to such creative use by John Rawls in his *A Theory of Justice*, could have been found in the work of economist John Harsanyi in the early 1950s; we do not know whether Rawls was, in fact, influenced by Harsanyi on this point.
7. See Peter Singer, *Animal Liberation* (New York: Avon Books, 1975).
8. To emphasize a point "another" is usually understood *not* to include future persons and not to consider nonhuman living creatures. Thus evaluative assumptions get made here. The desirability of efficiency so understood is hardly self-evident, but this point often goes undiscussed and undefended.
9. There may be many Pareto-optimal situations, and some may be, on the face of things, unjust and have been arrived at in an unjust manner.
10. Recently, for example, General Electric has offered an electric light bulb advertised as replacing a 100-watt bulb and saving money; the deal sounds attractive until one examines the fine print and learns that the "replacement" is simply a 90-watt bulb that yields less light.
11. Bell's act is reported in Cleveland Amory, *Man Kind?* (New York: Dell, 1974), p. 30.

35. The Ethical Basis of the Economic View of the Environment

A. Myrick Freeman III

I. Introduction

At least in some circles, economists' recommendations for a policy concerning pollution and other environmental problems are regarded with a good deal of skepticism and perhaps even distrust.¹ For example, when we suggest that economic factors such as cost should be taken into account in setting ambient air quality standards, we are told that it is wrong to put a price on human life or beauty. And when we argue that placing a tax or charge on the emissions of pollutants would be more effective than the present regulatory approach, we are told that this would simply create "licenses to pollute" and pollution is wrong.

I am not sure how much of this type of reaction stems from a misunderstanding or lack of familiarity with the arguments for the economists' policy recommendations, and how much is due to a rejection of the premises, analysis, and value judgments on which these recommendations are based. And I will not attempt to answer this question here. Rather, I will limit myself to making clear the ration-

ale for some of our recommendations concerning policy and the value judgments on which they are based.

To the economist, the environment is a scarce resource which contributes to human welfare. The economic problem of the environment is a small part of the overall economic problem: how to manage our activities so as to meet our material needs and wants in the face of scarcity. The economists' recommendations concerning the environment flow out of our analysis of the overall economic problem. It will be useful to begin with a brief review of the principal conclusions of economic reasoning concerning the allocation of scarce resources to essentially unlimited needs and wants. After reviewing some basic economic principles and the criteria that economists have used in the evaluation of alternative economic outcomes, I will explain the economic view of the environment and some of the major policy recommendations which follow from that view. I will conclude by identifying some of the major questions and possible sources of disagreement about the validity

and usefulness of economic reasoning as a way of looking at environmental problems.

II. Some Basic Economics

We begin with the basic premises that the purpose of economic activity is to increase the well-being of the individuals who make up the society, and that each individual is the best judge of how well off he or she is in a given situation. To give this premise some operational content, we assume that each individual has preferences over alternative bundles of economic goods and services. In other words, the individual can rank all of the alternative combinations of goods and services he can consume from most preferred to least preferred. Of course there may be ties in this ranking.² We assume that individuals act so as to obtain the most preferred (to them) bundles given the constraints imposed by technology and the availability of the means of production.

These preferences of individuals are assumed to have two properties which are important for our purposes: substitutability among the components of bundles, and the absence of limits on wants. Substitutability simply means that preferences are not lexicographic. Consider a consumption bundle labeled *A* with specified quantities of food, clothing, shelter, and so forth. Now consider alternative bundle *B* which contains 10 percent less clothing and the same quantities of all other goods. Since *B* contains less clothing, it is less desirable to the individual. In other words, bundle *A* is preferred to bundle *B*. But substitutability means that it is possible to alter the composition of bundle *B* by increasing the quantities of one or more of the other goods in the bundle to the point where the individual will consider *A* and *B* as equally preferred. That is to say, the individual can be compensated for the loss of some quantity of one good by increases in the quantities of one or more of the other goods. The value of the lost clothing to this individual can be expressed in terms of the quantities of the other goods which must be added to the bundle to substitute for it. This principle is the basis of the economic theory of value. In a market economy where all goods and services can be bought and sold at given prices in markets, the necessary amount of substitution can be expressed in money terms.

The significance of the substitution principle for the economic view of the environment should be

apparent. If the substitution principle applies to good things that are derived from a clean environment, then it is possible to put a price on those things. The price is the money value of the quantities of other goods that must be substituted to compensate for the loss of the environmental good. Whether the substitution principle applies to those things derived from the environment is essentially an empirical question about human behavior. It is possible to think of examples that violate the substitution principle. The slogan printed on all license plates issued in New Hampshire ("Live Free or Die") shows a lexicographic preference for freedom. If the statement is believed, there is no quantity of material goods that can compensate for the loss of freedom. It is not clear that all individuals have lexicographic preferences for freedom. And the question for our purpose is whether there are similar examples in the realm of environmental goods.

By unlimited wants, I mean that for any conceivable bundle *A*, it is possible to describe another bundle *B* with larger quantities of one or more goods such that an individual would prefer *B* to *A*. Is this property plausible? It is possible to imagine some upper limit on the gross consumption of food as measured by calories or weight. But quality and variety are also goods over which individuals have preferences. And it may always be possible to conceive of a bundle containing a more exotic dish or one with more careful preparation with higher quality ingredients. Again, whether this property is plausible is an empirical question about human behavior. But its significance for anti-growth arguments is apparent.

Much of economic theory is concerned with understanding how individuals with given preferences interact as they seek to attain the highest level of satisfaction. Many societies have developed systems of markets for guiding this interaction; and historically the bulk of economists' effort has gone to the study of market systems. In part this can be explained by the historic fact that economics as a separate discipline emerged during a period of rapid industrialization, economic change, and growth in the extent of the market system. But it is also true that as early as Adam Smith's time, it was recognized that a freely functioning market system had significant advantages over alternative means of organizing and coordinating economic activity. Even in more primitive societies, markets facilitate exchange

whereby an individual can attain a more preferred bundle by giving up less preferred goods in exchange for more preferred goods. And in more developed economies, markets also facilitate the specialization of productive activities and the realization of economies of scale in production.

A market system can be said to have advantages only in terms of some criterion and in comparison with some alternative set of economic institutions. It is time now to make the criterion explicit. The criterion is economic efficiency, or after the man who first developed the concept in formal terms, Pareto Optimality. An economy has reached a state of economic efficiency if it is not possible to rearrange production and consumption activity so as to make at least one person better off except by making one or more other individuals worse off. To put it differently, an economy is in an inefficient position if it is possible to raise at least one individual to a more preferred consumption bundle while hurting no one. If an economy is in an inefficient position, it is possible to achieve a sort of "free lunch" in the form of an improvement for at least one individual *at no cost* to anyone.

One of the fundamental conclusions of economic reasoning is that given certain conditions a market system will always reach a position of economic efficiency. The conditions are that: (a) all goods that matter to individuals (that is, all goods over which individuals have preference orderings) must be capable of being bought and sold in markets; and (b) all such markets must be perfectly competitive in the sense that there are large numbers of both buyers and sellers no one of which has any influence over market price.³ The extensiveness and competitiveness of markets are sufficient to assure that economic efficiency in the allocation of resources will be achieved. This conclusion provides much of the intellectual rationale for *laissez faire* capitalism as well as the justification for many forms of government intervention in the market, for example, anti-monopoly policies, the regulation of the prices charged by monopolies such as electric utilities, and, as we shall see, the control of pollution.

The ideal of efficiency and the perfectly competitive market economy which guarantees its attainment acts as a yardstick by which the performance of real world economies can be measured. If there is monopoly power in a market, the yardstick shows that there is a shortfall in the performance of

the economy. It would be possible by eliminating monopoly and restoring perfect competition to the market to increase output in such a way that no one would be made worse off and at least one person would be made better off. How monopoly power is to be eliminated without making at least the monopolist worse off is a difficult question in practice. But I will return to this point below.

The ideal of perfect competition and economic efficiency is a powerful one. But it is not without its limitations. Perhaps the most important of these is that there is no single, unique Pareto Optimum position. Rather there is an infinite number of alternative Pareto Optimums, each different from the others in the way in which it distributes economic well-being among the members of the society.

A society in which one individual owned all of the capital, land, and resources could achieve a Pareto Optimum position. It would likely be one in which all but one of the individuals lived in relative poverty. But it would not be possible to make any of the workers better off *without* making the rich person worse off. This Pareto Optimum position would be quite different from the Pareto Optimum which would be achieved by an economy in which each individual owned equal shares of the land, capital, and so forth. Which Pareto Optimum position is attained by an economy depends upon the initial distribution of the entitlements to receive income from the ownership of factor inputs such as land and capital. Each conceivable distribution of rights of ownership has associated with it a different Pareto Optimum. And each Pareto Optimum position represents the best that can be done for the members of society *conditioned* upon acceptance of the initial distribution of entitlements. Since the ranking of different Pareto Optimums requires the comparison of alternative distributions of well-being, it is inherently an ethical question. There is nothing more that economic reasoning can contribute to this issue.

III. Policy Evaluation

Given the fact that the real world economy is characterized by many market imperfections and failures and that for a variety of reasons it is not possible to create the perfect, all encompassing market system of the Pareto ideal, we must consider piecemeal efforts to make things better at the margin. The question is: what criterion should be used

to evaluate policy proposals which would alter the outcomes of existing market processes?

The Pareto Criterion says to accept only those policies that benefit some people while harming no one. In other words, this criterion rules out any policy which imposes costs on any individual, no matter how small the cost and no matter how large the benefits to any other members of the society. This is a very stringent criterion in practice. There are very few policy proposals which do not impose some costs on some members of the society. For example, a policy to curb pollution reduces the incomes and welfares of those who find it more profitable to pollute than to control their waste. The Pareto Criterion is not widely accepted by economists as a guide to policy. And it plays no role in what might be called "mainstream" environmental economics.⁴

The most widely accepted criterion asks whether the aggregate of the gains to those made better off measured in money terms is greater than the money value of the losses of those made worse off. If the gains exceed the losses, the policy is accepted by this criterion. The gains and losses are to be measured in terms of each individual's willingness-to-pay to receive the gains or to prevent the policy-imposed losses. Thus this criterion draws on the substitutability principle discussed earlier. If the gains or losses came in the form of goods over which individuals have lexicographic preferences, this criterion could not be utilized.

This criterion is justified on ethical grounds by observing that if the gains outweigh the losses, it would be possible for the gainers to compensate fully the losers with money payments and still themselves be better off with the policy. Thus if the compensation were actually paid, there would be no losers, only gainers. This criterion is sometimes referred to as the potential compensation criterion. This criterion is the basis of the benefit-cost analysis of public policy. Benefits are the money values of the gains to individuals and costs are the money values of the losses to individuals. If benefits exceed costs, the gainers could potentially compensate the losers.

There are two observations concerning the potential compensation criterion. First, the criterion is silent on the question of whether compensation should be paid or not. If society decides that compensation shall always be paid, compensation be-

comes a mechanism for assuring that there are never any losers and that all adopted policies pass the Pareto Criterion. On the other hand, if society decides that compensation should never be paid, the potential compensation criterion becomes a modern form of utilitarianism in which the aggregate of utilities is measured by the sum of the money values of all goods consumed by all individuals. Finally, society may decide that whether compensation should be paid or not depends upon the identity and relative deservingness of the gainers and losers. If this is the case, then society must adopt some basis for determining relative deservingness, that is, some ethical rule concerning the justness of creating gains and imposing losses on individuals.

The second observation concerns the measurement of gains and losses in money terms. Willingness to pay for a good is constrained by ability to pay. Economic theory shows that an individual's willingness to pay for a good depends on his income and that for most goods, higher income means higher willingness to pay, other things equal. As a consequence, the potential compensation criterion has a tendency to give greater weight to the preferences of those individuals with higher incomes. As a practical matter there are reasons to doubt that this bias is quantitatively significant in most cases. But the question is often raised when benefit-cost analysis is applied to environmental goods. And it is well to keep this point in mind.

IV. Environmental Economics

The environment is a resource which yields a variety of valuable services to individuals in their roles as consumers and producers. The environment is the source of the basic means of life support—clean air and clean water. It provides the means for growing food. It is a source of minerals and other raw materials. It can be used for recreation. It is the source of visual amenities. And it can be used as a place to deposit the wastes from production and consumption activities. The economic problem of the environment is that it is a scarce resource. It cannot be called upon to provide all of the desired quantities of all of the services at the same time. Greater use of one type of environmental service usually means that less of some other type of service is available. Thus the use of the environment involves trade-offs. And the environment must be

managed as an economic resource. But unlike other resources such as land, labor, or capital, the market does not perform well in allocating the environment to its highest valued uses. This is primarily because individuals do not have effective property rights in units of the environment.

For example, if a firm wishes to use one hour of labor time in production, it must find an individual who is willing to provide one hour of labor and it must pay that individual an amount at least equal to the value to the individual of that time in an alternative use. If a voluntary exchange of labor for money takes place, it is presumed that neither party is made worse off, and it is likely that both parties benefit from the exchange. Otherwise they would not have agreed to it. But if a firm wishes to dump a ton of sulfur dioxide into the atmosphere, it is under no obligation to determine whose health or whose view might be impaired by this use of the environment and to obtain their voluntary agreement through the payment of money. Thus firms need not take into account the costs imposed on others by their uses of the environment. Because there is no market for environmental services, the decentralized decision making of individuals and firms will result in a misallocation of environmental resources. The market fails. And the economy does not achieve a Pareto Optimum allocation.

Where markets have failed, economists have made two kinds of suggestions for dealing with market failure. The first is to see if markets can be established through the creation of legally transferable property rights in certain environmental services. If such property rights can be created, then markets can assume their proper role in achieving an efficient allocation of environmental services. Because of the indivisible nature of many aspects of the environment, for example, the urban air shed, there is limited scope for this solution. The second approach is to use various forms of government regulations, taxes, and subsidies to create incentives which replicate the incentives and outcomes that a perfectly functioning market would produce. Activities under this approach could include the setting of ambient air quality standards, placing limits on discharges from individual polluters, imposing taxes on pollution, and so forth. In the next section, I take up several specific applications of this approach to dealing with the environment in an economically rational manner.

V. Applications

Environment Quality Standards

An environmental quality standard is a legally established minimum level of cleanliness or maximum level of pollution in some part of the environment, for example, an urban air shed or a specific portion of a river. A standard, once established, can be the basis for enforcement actions against a polluter whose discharges cause the standard to be violated. The principle of Pareto Optimality provides a basis for determining at what level an environmental quality standard should be set. In general, Pareto Optimality requires that each good be provided at the level for which the marginal willingness to pay for the good (the maximum amount that an individual would be willing to give up to get one more unit of the good) is just equal to the cost of providing one more unit of the good (its marginal cost).

Consider for example an environment which is badly polluted because of existing industrial activity. Consider making successive one-unit improvements in some measure of environment quality. For the first unit, individuals' marginal willingnesses to pay for a small improvement are likely to be high. The cost of the first unit of clean-up is likely to be low. The difference between them is a net benefit. Further increases in cleanliness bring further net benefits as long as the marginal willingness to pay is greater than the marginal cost. But as the environment gets cleaner, the willingness to pay for additional units of cleanliness decreases, while the additional cost of further cleanliness rises. At that point where the marginal willingness to pay just equals the marginal cost, the net benefit of further cleanliness is zero, and the total benefits of environmental improvement are at a maximum. This is the point at which the environmental quality standard should be set, if economic reasoning is followed.

There are two points to make about this approach to standard setting. First, an environmental quality standard set by this rule will almost never call for complete elimination of pollution. As the worst of the pollution is cleaned up, the willingness to pay for additional cleanliness will be decreasing, while the extra cost of further clean-up will be increasing. The extra cost of going from 95 percent clean-up to 100 percent clean-up may often be several times larger than the total cost of obtaining the

first 95 percent clean-up. And it will seldom be worth it in terms of willingness to pay. Several economists have argued that the air quality standards for ozone that were first established in 1971 were too stringent in terms of the relationship between benefits and costs. If this is true, then the resources devoted to controlling ozone could be put to better use in some other economic activity. Many economists have urged Congress to require that costs be compared with benefits in the setting of ambient air quality standards.

The second point is that the logic of benefit-cost analysis does not require that those who benefit pay for those benefits or that those who ultimately bear the cost of meeting a standard be compensated for those costs. It is true that if standards are set so as to maximize the net benefits, then the gainers could fully compensate the losers and still come out ahead. But when beneficiaries do not compensate losers, there is a political asymmetry. Those who benefit call for ever more strict standards and clean-up, because they obtain the gross benefits and bear none of the costs, while those who must control pollution call for less strict standards.

Charging for Pollution

One way to explain the existence of pollution is in terms of the incentives faced by firms and others whose activities generate waste products. Each unit of pollution discharged imposes costs or damages on other individuals. But typically the dischargers are not required to compensate the losers for these costs. Thus there is no economic incentive for the discharger to take those costs into account. This is the essence of the market failure argument.

If it is impractical to establish a private market in rights to clean air, it may be possible to create a pseudo-market by government regulation. Suppose that the government imposed a charge or tax on each unit of pollution discharged and set the tax equal to the money value of the damage that pollution caused to others. Then each discharger would compare the tax cost of discharging a unit of pollution with the cost of controlling or preventing that discharge. As long as the cost of control were less than the tax or charge, the firm would prevent the discharge. In fact it would control pollution back to the point where its marginal cost of control was just equal to the marginal tax and by indirection equal to the marginal damage the pollution would cause. The prop-

erly set tax or charge would cause the firm to undertake on its own accord the optimum amount of pollution control. By replicating a market incentive, the government regulation would bring about an efficient allocation of resources.

Since the firm would likely find that some level of discharges would be more preferred to a zero discharge level, it would be paying taxes to the government equal to the damages caused by the remaining discharges. In principle, the government could use the tax revenues to compensate those who are damaged by the remaining discharges.

Risk and the Value of Life

Because some forms of pollution are harmful to human health and may increase mortality, economists have had to confront the question of the economic value of life. It turns out that the "value of life" is an unfortunate phrase which does not really reflect the true nature of the question at hand. This is because pollutants do not single out and kill readily identifiable people. Rather, they result in usually small increases in the *probability* of death to exposed groups of individuals. So what is really at issue is the economic value of reductions in the risk of death. This is a manageable question and one on which we have some evidence.

People in their daily lives make a variety of choices that involve trading off changes in the risk of death with other economic goods whose values we can measure in money terms. For example, some people travel to work in cars rather than by bus or by walking because of the increased convenience and lower travel time, even though they increase the risk of dying prematurely. Also, some people accept jobs with known higher risks of accidental death because those jobs pay higher wages. The "value" of saving a life can be calculated from information on individuals' trade-offs between risk and money.

Suppose there were a thousand people each of whom has a probability of .004 of dying during this next year. Suppose an environmental change would reduce that probability to .003, a change of .001. Let us ask each individual to state his or her maximum willingness to pay for that reduction in risk. Suppose for simplicity that each person states the same willingness to pay, \$100. The total willingness to pay of the group is \$100,000. If the policy is adopted, there will on average be one less death during this next year ($.001 \times 1000$). The total willingness to pay for a

change that results in one fewer deaths is \$100,000. This is the "value of life" that is revealed from individual preferences. Efforts to estimate the value of life from data on wage premiums for risky jobs have led to values in the range of \$500,000 to \$5 million.

If an economic approach is to be used in setting standards for toxic chemicals, hazardous air pollutants, and so forth, then some measure of the value of reductions in risk must be the basis for computing the benefits of pollution control. There are immense practical difficulties in providing accurate, refined estimates of this value. But these are not my concern here. Rather I am concerned with the ethical issues of even attempting to employ this approach to environmental decision making.

I think that the principal ethical issue here is compensation. Suppose that a standard has been set for an air pollutant such that even with the standard being met the population has a higher probability of death than if the pollutant were fully controlled. The standard was presumably set at this level because the cost of eliminating the remaining risk exceeded the individuals' willingness to pay to eliminate the risk. Many people would argue that the risk should be reduced to zero regardless of cost. After all, some people are being placed at risk while others are benefiting by avoiding the cost of controlling pollution. But suppose the population is compensated for bearing this risk with money from, for example, a charge on the polluting substance. Is there then any reason to argue for reducing pollution to zero? If the pollution were reduced to zero and the compensation withdrawn, the people at risk would be no better off in their own eyes than they are with the pollution and compensation. But some people would be made worse off because of the additional costs of eliminating the pollution.⁵

Future Generations

Some environmental decisions impose risks on future generations in order to achieve present benefits. In standard benefit-cost analysis based on the economic efficiency criterion, a social rate of discount is used to weight benefits and costs occurring at different points in time.⁶ There have been long debates about the appropriateness of applying a discount rate to effects on future generations. It is argued that ethically unacceptable damage imposed on future generations may be made to appear acceptably small, from today's perspective, by discounting.

Consider the case where this generation wishes to do something which will yield benefits today worth \$B. This act will also set in motion some physical process which will cause \$D of damages 100,000 years from now. Assume that the events are certain and that the values of benefits and damages based on individual preferences can be accurately measured.

In brief, the argument against discounting is: at any reasonable (nonzero) discount rate, r , the present value of damages

$$\$P = \frac{\$D}{(1+r)^{100,000}}$$

will be trivial and almost certainly will be outweighed by present benefits. The implication of discounting is that we care *virtually nothing* about the damages that we inflict on future generations provided that they are postponed sufficiently far into the future. Therefore, the argument goes, we should discard the discounting procedure. Instead, since the real issue is intergenerational equity, a zero discount rate should be used. This would represent the most appropriate value judgment about the relative weights to be attached to the consumption of present and future generations.

I believe this argument is confused. Certainly, the problem is equity; but that has nothing to do with discounting. Rather, the equity question revolves around the distinction between actual and potential compensation.

In order to separate the compensation and discounting issues, consider a project for which both benefits and costs are realized today. Whenever benefits are greater than costs, the efficiency criterion says that the project should be undertaken, even if the benefits and costs accrue to different groups. This is because there is at least the *possibility* of compensation. Whether compensation should be paid or not is a value judgment hinging on equity considerations.

Now consider the intergenerational case. If \$B is greater than \$P (the discounted present value of future damages), the project is worthwhile and should be undertaken if the objective is economic efficiency. If the trivial sum of \$P is set aside now at interest, it will grow to

$$(1+r)^{100,000} \$P$$

which of course is the same as \$D and therefore by definition will just compensate the future generation

for the damages our actions will have imposed on them. If actual compensation is provided for, no one, present or future, will be made worse off, and some will benefit.

Some may wish to adhere to the principle that compensation should *always* be paid. The principle would apply to losers in the present as well as future generations. The discount rate would help them to calculate the amount to be set aside for future payment. Others may wish to say that whether compensation should be paid or not depends on the relative positions of potential gainers and losers. Finally some will choose to ignore the compensation question entirely. But no matter how they resolve the compensation question, they should discount future damages.

Ecological Effects

Suppose that an accidental spill of a toxic chemical or crude oil wipes out the population of some marine organism in a certain area. What is the economic value of this damage? If the organism is a fish that is sought by sports or commercial fishermen, then there are standard economic techniques for determining the willingness to pay for or value of fish in the water. If the organism is part of the food chain which supports a commercially valuable fishery, then it is also possible, at least conceptually, to establish the biological link between the organism and the economic system. The value of the organism is based on its contribution to maintaining the stock of the commercially valued fish. But if there is no link between the organism and human production or consumption activity, there is no basis for establishing an economic value. Those species that lie completely outside of the economic system also are beyond the reach of the economic rubric for establishing value.

Some people have suggested alternative bases for establishing values, for example, cost of replacing the organisms, or cost of replacing biological functions such as photosynthesis and nitrogen fixation. But if those functions have no economic value to man, for example, because there are substitute organisms to perform them, then we would not be willing to pay the full cost of replacement. And this signifies that the economic value is less, perhaps much less, than replacement cost.

Rather than introduce some arbitrary or biased method for imputing a value to such organisms, I

prefer to be honest about the limitations of the economic approach to determining values. This means that we should acknowledge that certain ecological effects are not commensurable with economic effects measured in dollars. Where trade-offs between non-commensurable magnitudes are involved, choices must be made through the political system.

VI. Conclusions

The argument for the adoption of the economists' point of view concerning environmental policy can be summarized as follows. Given the premises about individual preferences and the value judgment that satisfying these preferences should be the objective of policy, the adoption of the economists' recommendations concerning environmental policy will always lead to a potential Pareto improvement, that is, it will always be possible through taxes and compensating payments to make sure that at least some people are better off and that no one loses. Society could choose not to make these compensating payments; but this choice should be on the basis of some ethical judgment concerning the desirability of the gains and losses from the policy.

It might be helpful at this point to review and summarize these premises and value judgments so that they might be in the focus of discussion:

1. Should individual preferences matter? If not individual preferences, then whose preferences should matter? What about ecological effects that have no perceptible effect on human welfare, that is, that lie outside of the set of things over which individuals have preferences?
2. Does the substitution principle hold for environmental services? Or are individuals' preferences for environmental goods lexicographic? This is an empirical question. Economists have developed a substantial body of evidence that people are willing to make trade-offs between environmental goods such as recreation, visual amenities, and healthful air and other economic goods.
3. Are preferences characterized by unlimited wants? This is also an empirical question. But I think that most economists would agree that if there are such limits, we have not begun to approach them for the vast bulk of the citizens of this world. A related question is whether it should be the objective of economic activity to satisfy wants without limits?

But this question is more closely related to question (1) concerning the role of individual preferences.

4. Is achieving an efficient allocation of resources that important? Or, as Kelman (1981) has argued, should we be willing to accept less economic efficiency in order to preserve the idea that environmental values are in some sense superior to economic values? An affirmative answer to the latter question implies a lexicographic preference system and a rejection of the substitution principle for environmental goods.

5. Should compensation always be paid? Paid sometimes? Never? This is an ethical question. But as I have indicated, I think it plays a central role in judging the ethical implications of economists' environmental policy recommendations. Not only is there the question of whether compensation should be paid, but also the question of who should be compensated. For example, should compensation be paid to those who are damaged by the optimal level of pollution? Or should compensation be paid to those who lose because of the imposition of pollution control requirements?

Notes

1. For some empirical evidence in support of this assertion, see Kelman (1981).

2. This is equivalent to saying that the individual has a utility function which assigns utility numbers to all possible consumption bundles. More preferred bundles have higher utility numbers.
3. There are other more technical conditions which need not concern us here.
4. For a different view of the Pareto Criterion and public policy, see Peacock and Rowley (1975).
5. In discussions of the use of risk-benefit analysis in policy making, the distinction is sometimes made between voluntary and involuntary risk. The argument being made is that involuntary risks are somehow worse. But I think that this misses the point. The real distinction is between compensated and uncompensated risk. A compensated risk is one, by the definition of compensation, that the individual would bear voluntarily.
6. The following argument is based on Freeman (1977).

References

- Freeman, A. Myrick, III. "Equity, Efficiency, and Discounting: The Reasons for Discounting Intergenerational Effects," *Futures* (October, 1977), 375-376.
- Kelman, Steven. "Economists and the Environmental Muddle," *The Public Interest* 641 (Summer, 1981), 106-123.
- Peacock, Alan T., and Charles K. Rowley. *Welfare Economics: A Liberal Restatement*, London, M. Robertson, 1975.

36. At the Shrine of Our Lady of Fátima, or Why Political Questions Are Not All Economic

Mark Sagoff

Lewiston, New York, a well-to-do community near Buffalo, is the site of the Lake Ontario Ordinance Works, where the federal government, years ago, disposed of the residues of the Manhattan Project. These radioactive wastes are buried but are not forgotten by the residents, who say that when the wind is southerly radon gas blows through the town. Several parents at a recent conference I attended there described their terror on learning that cases of leukemia had been found among area children. They

feared for their own lives as well. At the other sides of the table, officials from New York State and from local corporations replied that these fears were unfounded. People who smoke, they said, take greater risks than people who live close to waste disposal sites. One speaker talked in terms of "rational methodologies of decisionmaking." This aggravated the parents' rage and frustration.

The speaker suggested that the townspeople, were they to make their decision in a free market,