

Economics, Ethics, and Long-Term Environmental Damages

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Neither environmental economics nor environmental philosophy have adequately examined the moral implications of imposing environmental degradation and ecosystem instability upon our descendants. A neglected aspect of these problems is the supposed extent of the burden that the current generation is placing on future generations. The standard economic position on discounting implies an ethical judgment concerning future generations. If intergenerational obligations exist, then two types of intergenerational transfer must be considered: basic distributional transfers and compensatory transfers. Basic transfers have been the central intergenerational concern of both environmental economics and philosophy, but compensatory transfers emphasize obligations of a kind often disregarded.

INTRODUCTION

The current population of Earth is responsible for extensive and expanding environmental damages. Many wastes, freely or inadequately disposed of, are highly toxic in amounts far in excess of the natural capacities of ecosystems to assimilate them. They will accumulate and persist for decades, centuries, or longer. Examples are PCBs, radioactive materials, chlorofluorocarbons, and fossil fuels. Some cause disease; others are producing global climate changes. The resulting environmental damages are significant, irreversible, long-term, and asymmetrically distributed over time. The net benefits accrue now; the net costs accrue in the future.

As the extent of these damages increases, the question becomes more urgent: should this generation care about its actions that result in a degraded environment in the distant future? If we do care, what should be done? Both environmental economics and environmental philosophy have tried to answer these questions; however, there has been limited cross-fertilization of ideas between the fields. By comparing results in the two, I attempt to analyze current obligations regarding future environmental damages.

I argue that by choosing the discount rate economists take an ethical position about the claims of future generations, a position that has received little attention and has inadequate justification. I consider and reject four justifications for discounting. I then consider an alternative approach that environmental econo-

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mists sometimes adopt, which studies the policy implications of various ethical principles. I conclude that the principles they employ are too utilitarian to do justice to the rights that future people have to be free from such harms as we impose upon them. Such rights entitle future people either to compensation in the form of transfers or to a veto over certain policies.¹

DISCOUNTING THE FUTURE

Discounting calculates the present value of an ongoing stream of costs and benefits associated with a project or policy. The resulting present value represents the amount of money that must be borrowed at a given interest rate to supply the same stream of net returns as would be obtained through the project or policy, assuming perfect capital markets. If benefits exceed costs in every time period, the present value is positive for any discount rate. Generally, however, the choice of the social discount rate is crucial in determining whether the present value is positive or negative.

Economists defend such discounting of the future as the way people in fact behave and value things. Individuals prefer benefits now rather than later, which economists call a positive time preference. Both consumers, via this positive rate of time preference, and producers, via the social opportunity cost of capital, treat the future as less important than the present. Consumers lend money and expect to be rewarded because they have abstained from consumption, while someone else used their money. An example is savings account interest. Producers earn more interest on earlier cash receipts by loaning them to others in the economy and tying into their productivity, making earlier profits more valuable.

Neoclassical economists have shown how, in a simplified world, a unique discount rate is determined by the market. Individuals make decisions about their rates of present consumption versus savings (the marginal rates of substitution between present and deferred consumption). Aggregated, these savings provide a supply of loanable funds. Deferring current consumption increases future income via the marginal productivity of capital. Under perfect competition, savings and investment schedules intersect to define a unique equilibrium, where the marginal rate of return on capital equals the marginal rate of time preference.² As a result, a single discount rate prevails.

¹ I am assuming that some stable population has been achieved and will exist into the distant future. An increasing population would exacerbate the problems under discussion and might imply a moral argument in favor of population control. However, long-term environmental damages can exist whether or not population is controlled and are a function of the nature of our society, not merely its scale. Developed countries, with populations under control, are responsible for most of the environmental degradation shipped into the future.

² John V. Krutilla and Anthony C. Fischer, "Further Analysis of Irreversibility: Discounting, Intergenerational Transfers, and Uncertainty," in John V. Krutilla and Anthony C. Fischer, *The*

But is such a market-determined discount rate suitable for long-term, public policy decisions? Consider the fact that only the time preferences of the present generation enter into the process.³ Individuals with finite life expectancies are likely to act differently in their private consumption decisions from a society that has a collective commitment to life in perpetuity. Because I will be dead in thirty years, I am not thinking about a sustainable society three hundred years into the future in forming my preferences. In such a context, the supply of loanable funds for investment is influenced by private time preferences that diverge from a collectively determined rate of social time preference that would arise if those future people could also voice their preferences. A higher discount rate than is socially optimal results, and the level of investment remains too low to make adequate provision for future generations.⁴

In fact, discounting the future at almost any positive rate creates insignificant present values for even catastrophic losses in the distant future. Because people forming their present and short-term preferences as consumers and investors in markets simply do not consider the consequences in the remote future, the standard application of cost-benefit analysis, with discounting, to long-term environmental damages makes the distant future almost valueless. In addition, because net costs are distributed across the future and net benefits received now, degrading the future environment is falsely attractive.

Some authors maintain that discounting future streams of costs and benefits (on the grounds of time preference or capital productivity) has been widely accepted by economists.⁵ If so, then the only problem lies in practicing the technique. Arguing about the choice of a social rate of discount, economists have split into the following groups: (1) those who hold that an infinite social discount rate should be used; (2) those who believe that the intergenerational or intertemporal discount rate (between generations) should be greater than zero but less than infinity; (3a) those who think that the intratemporal (within a generation) and intergenerational or intertemporal discount rates should be the same or (3b) that the appropriate social discount rate is zero; and (4) those who feel that a negative intertemporal discount rate should be used. The terms *intertemporal* and *intergenerational* are used synonymously by economists to refer to distinct time periods into which society is thought to be split. The phrase *intra-temporal* refers to the space within such a period. In this context, economists model resource

Economics of Natural Environments: Studies in the Valuation of Commodity and Amenity Resources (Baltimore: Johns Hopkins Press, 1975), chap. 4, p. 61.

³ As Krutilla and Fisher note.

⁴ F. P. Ramsey, "A Mathematical Theory of Saving," *Economic Journal* 38, no. 152 (1928): 543-59; A. C. Pigou, *The Economics of Welfare* (London: Macmillan, 1932).

⁵ David Simpson and James Walker, "Extending Cost-Benefit Analysis for Energy Investment Choices," *Energy Policy* 15, no. 3 (1987): 221.

allocation in terms of generations as distinct groups, with intratemporal redistributions within the group and intergenerational redistributions between groups.

Lemons has divided the philosophical viewpoints on whether a duty to posterity exists into three categories: (1) the claim that no moral obligations exist beyond the immediate future; (2) the claim that moral obligations to the future exist, but that the future should be assigned less weight than the present; and (3) the claim that the rights and interests of future persons should be the same as those of contemporary persons.⁶ To be complete, this division requires an additional claim: (4) that moral obligations to the future exist, and that the future should be assigned more weight than the present.⁷

There is an obvious correlation between these economic and philosophical perspectives. The economist's (3) splits Lemons' third viewpoint into two, and forces a clarification of what "same" implies. As members of the current generation, we may weigh our own welfare differently over our own lifetimes, treating the future as less valuable. If future generations are to be treated in the "same" way, then the intertemporal and intergenerational discount rates should be equal. Yet, weighting the present more heavily than the future is often a myopic policy that we choose for ourselves. For example, intratemporally, people fail to provide adequately for their retirement, leading to government support for the elderly. More importantly, as mentioned earlier, any positive discount rate causes catastrophes in the distant future to be reduced to insignificant factors in the present decision making process.

To accept discounting as the proper approach to intertemporal distribution requires an unavoidable moral judgment.⁸ A zero social discount rate, when intergenerational decisions are involved, prevents future environmental damages from being ignored, counting every future effect as if it has to be borne immediately. On the other hand, only at the extreme of an infinite discount rate are no future effects of current actions taken into account. More commonly, an arbitrary but positive rate is used. Thus, the future is held to matter, but the degree of concern depends on the rate chosen.

JUSTIFICATIONS FOR DISCOUNTING

Four general justifications for discounting the future are commonly advocated.⁹ (1) It has been argued that "the temporal location of our descendants disqualifies them from equal treatment with current members of the body politic." There are

⁶ John Lemons, "Atmospheric Carbon Dioxide: Environmental Ethics and Environmental Facts," *Environmental Ethics* 5 (1983): 31.

⁷ This fourth category is not unrealistic. The Russian people made extreme sacrifices after their revolution in order that their descendants might be better off.

⁸ Talbot Page, *Conservation and Economic Efficiency* (Baltimore: Johns Hopkins Press, 1977).

⁹ The first three can be found in Gregory Kavka, "The Futurity Problem," in Richard I. Sikora and Brian Barry, eds., *Obligations to Future Generations* (Philadelphia: Temple University Press,

a number of questions associated with this justification. Should future people be treated as if they are already dead? The current generation does affect the probability that a future individual's needs for drinkable water and clean air will be satisfied. When, or where, should the effective dividing line be drawn between the important now and the less important future?¹⁰ Factors such as age, temperament, or interest affect where we divide the time line into present and future. Failing to acknowledge the importance of environmental degradation in the future, just because psychologically it is thought of as separated from the present, is totally arbitrary.¹¹

(2) The argument has been made that "we should restrict our attention to the aspects of our actions for which preferences are known and exclude unknown future preferences." This argument is similar to one that says we need to know something about personal identities before we can intelligently make hypothetical intergenerational contracts.¹² No coherent sense can be given to making persons better or worse off if the specific persons are different *ex ante* and *ex post*. This argument relies on the assumption that because all rights attach to individuals, the identity of individuals is central to their rights. Nevertheless, individuals may and do vary widely in the preferences that constitute their identity.

Further, identity depends on existence, which is foundational to it. Individuals cannot claim to have been harmed by the actions of their predecessors that leave them in poverty, for example, if their very existence is contingent upon the events causing that poverty. To do so would be comparable to the complaint of children to their parents that they are poor, when the parents chose poverty to make their existence possible. As long as future individuals do not regret their existence, any action that results in such existence is justified, despite the other undesirable consequences, because the future identity of individuals is also determined by that action.

Such arguments, however, fail to account for the fact that there can be wrongs to future persons despite present indeterminacy concerning their existence and identities and our ignorance of their special needs. Whoever comes to exist in the future can reasonably be expected to have the same biological and social needs as

1978); Mary B. Williams, "Discounting Versus Maximum Sustainable Yield," *ibid.*; Robin Attfield, *The Ethics of Environmental Concern* (New York: Columbia University Press, 1983); and R. Kerry Turner, "Wetland Conservation: Economics and Ethics," in David Collard, David Pearce, and David Ulph, eds., *Economics, Growth and Sustainable Environment* (New York: St. Martin's Press, 1988).

¹⁰ Discounting assumes no dividing line because benefits and costs are reduced toward an asymptotic limit. However, effectively the future becomes insignificant as future values tend toward zero.

¹¹ Nigel Dower, "Ethics and Environmental Futures," *International Journal of Environmental Studies* 21 (1983): 29-44.

¹² Derek Parfit, "Energy Policy and the Further Future: The Identity Problem," in Douglas Maclean and Peter G. Brown, eds., *Energy and the Future* (Totowa, N.J.: Rowan and Allanheld, 1983). See also Bryan G. Norton, "Environmental Ethics and the Rights of Future Generations," *Environmental Ethics* 4 (1982): 319-37.

those now existing. Annette Baier has concluded that "the wrongs we can do a future person are usually restricted to injuries to interests fixed before the identity of future persons are fixed (and to such frustrations and pain as is consequent upon the injury to such interests), and cannot include injury to interests not yet fixed or frustration of wants and concerns not yet fixed or hurts to sensibilities not yet fixed."¹³ A safe assumption is that the basic human needs for food, shelter, health, and security will, over many millennia, remain a prerequisite for the satisfaction of other more specific and now unknown desires. In that respect, we today do not differ from the ancient Sumerians; nor will those two thousand years from now differ from us.

David Richards has argued that the relevant moral issue is the determination of how persons will fare under different policies, without any attention to the particularities of exactly who exists in the future.¹⁴ Regardless of whoever exists, they will be better off without cancer (which may be caused by the pollutants we bequeath the future). Making a choice about cancer in their future does not require that the particular individuals be identified. Personal identities are irrelevant to such policy choices.

(3) "Because the human race will at some stage become extinct, more consumption today prevents potential resource wastage tomorrow." If this extinction is exogenous (for example, due to the cooling of the sun) and the date can be predicted, then the intergenerational distribution of world resources can be arranged to ensure that nothing is left.¹⁵ We could use up the last bit of resource at the moment the sun burns out. If there is uncertainty concerning the extinction date, we could maintain a reserve, as an insurance policy. This approach, on a global scale, involves much the same problem that an individual faces in allocating consumption over his or her own lifetime, except that in this case there is no next generation. The point is that exogenous extinction can, at least theoretically, be considered without discriminating against the future to the extent of effectively excluding it from current decisions.

Perhaps there will be, instead, an endogenous extinction, in which the human race is in control of the factors that determine its extinction. Assuming that the Earth has a finite stock of materials and energy, a high consumption rate today means fewer lives in the future. Yet, such control over our own destiny does not imply weighting the future less than the present, if there is a decision to have no future at all. Analysts differ about what to think of such a self-chosen species

¹³ Annette Baier, "For the Sake of Future Generations," in Tom Regan, ed., *Earthbound: New Introductory Essays in Environmental Ethics* (Philadelphia: Temple University Press, 1984), p. 233.

¹⁴ David A. J. Richards, "Contractarian Theory, Intergenerational Justice, and Energy Policy," in Douglas Maclean and Peter G. Brown, eds., *Energy and the Future* (Totowa, N.J.: Rowan and Allanheld, 1983), p. 141.

¹⁵ Geoffrey Heal, "The Intertemporal Problem," in D. W. Bromley, ed., *Natural Resource Economics: Policy Problems and Contemporary Analysis* (Boston: Kluwer Nijhoff, 1986). Ronald Cummings and Spencer Pearse make a comment following that article that is directly relevant here.

extinction. Georgescu-Roegen argues for intergenerational equity.¹⁶ The spaceship Earth literature emphasizes increases in future consumption to balance environmental degradation.¹⁷

(4) The final justification for discounting relies upon the uncertainty of future events. If the uncertainty concerns the demand for a depletable resource, it is assumed to be positively related to the distance in time from the depletion decision. The further off we try to imagine, the less sure we are that future people will want or need this resource. The conventional answer is to reflect such uncertainty by increasing the discount rate, resulting in a faster rate of depletion. Fisher has shown how the type of uncertainty under consideration can result in either increased or decreased depletion rates (for, sometimes, uncertainty can result in resources being preserved for the future rather than depleted faster).¹⁸ When assimilative capacity is being depleted, with uncertainty as to the stock, risk aversion favors reducing the rate of depletion. For example, we should reduce the rate at which carbon dioxide is presently released, if it is now degrading the future capacity of the atmosphere to absorb it, and postpone depletion until a future date, more at a pace that the atmosphere can handle.

Similarly, in the appraisal of public projects the argument has been put forward that the appropriate adjustment for risk is made by raising the discount rate used to calculate the present value of the investment. However, except under special circumstances, there is no well-defined way to adjust the discount rate such that it will make the appropriate adjustment for risk in the present value of uncertain future benefits and costs in each period. This problem is explained at length, in the context of energy related projects, by Lind.¹⁹

The argument can be applied to projects that create long-term damages. There is some probability that no damages will occur, and this probability may be thought to increase over time. Taking this position is comparable to arguing that undertaking actions which can harm others is justified because there is a chance they will remain unharmed. My loosening the wheels on your car is acceptable because I am not really sure whether you will crash or not; and I will be less sure about the matter thirty years from now than I am about it thirty days from now.

Having looked at these rather doubtful and sometimes strained justifications, and keeping in mind the seriousness and urgency of the issue, I now turn to some appropriate ethical rules for further guidance.

¹⁶ Nicholas Georgescu-Roegen, *The Entropy Law and the Economic Process* (Cambridge, Mass.: Harvard University Press, 1971).

¹⁷ Ralph C. d'Arge, "Essay on Economic Growth and Environmental Quality," *Swedish Journal of Economics* 73, no. 1 (March 1971): 25-41; Ralph C. d'Arge and K. C. Kogiku, "Economic Growth and the Environment," *Review of Economic Studies* 40 (1973): 61-78.

¹⁸ Anthony C. Fisher, *Resource and Environmental Economics* (Cambridge: Cambridge University Press, 1981), pp. 45-69.

¹⁹ Robert C. Lind, "A Primer on the Major Issues Relating to the Discount Rate for Evaluating National Energy Options," in R. C. Lind, *Discounting for Time and Risk in Energy Policy* (Baltimore: Johns Hopkins, 1982).

ETHICAL RULES IN ENVIRONMENTAL ECONOMICS

In order to focus attention on intertemporal resource allocation and distribution of welfare (between generations), economists commonly assume that consumption is split equally among the members of any one generation.²⁰ This assumption avoids intratemporal distribution and aggregation issues (within a generation). In this way, generations are treated as if they are individuals. Karl-Goran Maler has discussed the conditions under which the well-being of members of a generation can be aggregated and treated as a single unit.²¹ A similar assumption, made by Norgaard and Howarth, treats each generation as a group of homogeneous individuals who can be represented as a single agent.²² Thus, even though economists work with a utilitarianism that is supposedly individualistic (that is, all interests and benefits are those of single individuals), such assumptions effectively aggregate whole generations into single agents having utilities. This approach is followed below.

In order to clarify the relationship between generations, environmental economists consider the implications of adopting alternative ethical rules.²³ In most instances, these ethical rules have been defined in terms of individual welfare under some specified conditions, under which they can then be simplified so as to be expressed in mathematical formulae. I examine four ethical rules to analyze their implications for the treatment of long-term environmental damages. These four rules are the classical utilitarian, the egalitarian, the libertarian (Paretian), and the elitist.

²⁰ Page, *Conservation and Economic Efficiency*, p. 153; Robert Solow, "Intergenerational Equity and Exhaustible Resources," *Review of Economic Studies* 41 (1974): 29-45.

²¹ Karl-Goran Maler, *Environmental Economics: A Theoretical Inquiry* (Baltimore: Resources For The Future, Johns Hopkins Press, 1974), chap. 4, sec. 11.

²² Richard B. Norgaard and Richard B. Howarth, "Sustainability and Discounting the Future," presented at the conference on Ecological Economics of Sustainability, Washington, D.C., May 1990.

²³ William D. Schulze, David S. Brookshire, and Todd Sandler, "The Social Rate of Discount for Nuclear Waste Storage: Economics or Ethics?" *Natural Resources Journal* 21 (1981): 811-32; William D. Schulze and David S. Brookshire, "Intergenerational Ethics and the Depletion of Fossil Fuels," in J. Quirk, K. Terasawa and D. Whipple, eds., *Coal Models and Their Use in Government Planning* (New York: Praeger, 1982); David Pearce, "Ethics, Irreversibility, Future Generations and the Social Rate of Discount," *International Journal of Environmental Studies* 21 (1983): 67-86; Allen V. Kneese, Shaul Ben-David, and William D. Schulze, "The Ethical Foundations of Benefit-Cost Analysis," in Douglas Maclean and Peter G. Brown, eds., *Energy and the Future* (Totowa, N.J.: Rowan and Allanheld, 1983); Allen V. Kneese et al., "Economic Issues in the Legacy Problem," in Roger E. Kasperson, ed., *Equity Issues in Radioactive Waste Management* (Cambridge, Mass.: Oelgeschlager, Gunn and Hain, 1983), pp. 203-26; Allen V. Kneese and William D. Schulze, "Ethics and Environmental Economics," in Allen V. Kneese and J. L. Sweeney, eds., *Handbook of Natural Resource and Energy Economics*, vol. 1 (Amsterdam: North Holland, 1985), pp. 191-220; Ralph C. d'Arge, "Ethical and Economic Systems for Managing the Global Commons," in D. B. Botkin et al., eds., *Changing the Global Environment: Perspectives on Human Involvement* (Orlando: Academic Press, 1989).

The elitist rule requires that the welfare of the best off be improved. Actions that decrease elitist welfare are wrong. The egalitarian rule is the exact opposite, requiring increases in the welfare of the worst off. Both rules focus entirely upon the relative level of well-being without concern about quantifying the sizes of the welfare gains or losses. The egalitarian rule requires that the welfare of different generations count equally with each other. If we take an indefinitely large (an infinite) time horizon, and assume finite resources, a policy of mere subsistence in each generation follows. In order to spread a finite amount of resources across infinite generations, and maintain equity, all generations must be committed to living at a subsistence level. Nevertheless, we cannot really move to such a subsistence level, because the future would then have lower welfare than it would if we continued as we are now operating. Thus, distributional transfers should maintain the level of welfare inherited. Any reduction of that welfare level must be countered by a corresponding increase.

Elitism only considers future generations insofar as the welfare of future generations figures into the welfare of individuals (selfish altruism) or insofar as the future comprises the elite. Distributional transfers are made only if they increase the welfare of the best off generation. Injuries caused to future generations are uncompensated as long as the welfare of the elite is unaffected. In addition, changes that improve the welfare of the elite at the expense of others may be undertaken.

Neoclassical utilitarianism (maximizing total utility) focuses upon the gains and losses that comprise personal welfare without any concern about welfare levels. Doing so requires that any generation sacrifice one unit of utility when another generation can, as a result, gain more than one unit. Intergenerational redistributions are made according to the respective marginal utilities of consumption, where utility is dependent upon our own consumption alone.²⁴ A utilitarian ethical system requires intergenerational welfare redistributions if future generations have a marginal utility greater than the current generation. (Determining the marginal utility of future generations poses a practical barrier to making this requirement operational.) Compensation for the effects of long-term pollution occurs when the marginal utility of the current generations' loss, from the compensation payment, is less than the future generations' marginal utility gain.

²⁴ An egalitarian argument can follow from the utilitarian approach. Such an argument requires an appreciation of the law of diminishing marginal utility (additional income yields less than previous additions, though the total continues to rise), and assumes that all individuals are fundamentally alike in their preferences and capabilities for enjoying goods. In the strict form, the utilitarian argument for egalitarianism depends crucially upon the identity of the utility of income across generations. At the opposite extreme, an elitist argument can be made if the marginal utility of the income of the rich generation is higher than that of the poor generation. For a discussion of this issue in an intratemporal context, see A. J. Culyer, *The Economics of Social Policy* (New York: Dunellen Company, 1973), pp. 64-90.

Under a Paretian ethical rule the status quo is maintained. No redistribution of welfare is allowed unless at least one person is made better off and none worse off. Further, the Pareto criterion is commonly applied in the intergenerational context in a way that is similar to its application in the intragenerational context. An initial endowment is allocated to each generation and redistributions are then allowed if they are Pareto improvements. When the rule is applied, the outcome depends upon the definition of the starting point. Assuming that the next generation can be at least as well off as the welfare level inherited, the Paretian rule requires that transfers maintain at least that level. Causing the welfare of the next generation to fall below the level received from the previous generation makes the next generation worse off. Injury must then be fully compensated.

LIMITATIONS OF THE ETHICAL RULES

From a philosophical viewpoint, these four alternatives considered in economics are somewhat limited. Effectively, the process of incorporation transforms all the rules into variations on a utilitarian theme. The Paretian ethic is a restricted utilitarianism according to which total utility is maximized unless doing so makes somebody worse off. Central facets of utilitarianism also exist in each of the other rules.

Utilitarianism has two main features, the principle of consequentialism and the principle of utility. Consequentialism determines the rightness or wrongness of an act by the results that flow from it. According to the utility principle, some resulting state—pleasure, happiness, welfare—is the intrinsic good. The egalitarian and elitist rules presume both the consequentialist principle and the utility principle. The only change from neoclassical utilitarianism is the concern over the welfare levels of specific groups (the elite or the poor) as opposed to the welfare of all social levels aggregated as if they are one. Concern for this or that welfare level may or may not be appropriate, but it does not really involve an alternative ethical principle. The use of welfare levels is but a variation on the neoclassical utilitarian concern for good consequences.²⁵

The problem that economists are confronting here seems to go beyond the utilitarian framework. In an effort to incorporate new philosophical ideas, they have mounted a challenge against utilitarianism, but then retracted it by subsuming it back into the utilitarian framework. In the next section, I argue that this confrontation is between a deontological perspective and a teleological one. Teleological ethical theories, which include utilitarian ones, place the ultimate criterion of morality in some nonmoral value (for example, welfare) that results

²⁵ Amartya K. Sen, "Approaches to the Choice of Discount Rates for Social Benefit-Cost Analysis," in R. C. Lind, ed., *Discounting for Time and Risk in Energy Policy* (Baltimore: Johns Hopkins Press, 1982); Talbot Page, "Intergenerational Justice as Opportunity," in Douglas Maclean and Peter G. Brown, eds., *Energy and the Future* (Totowa, N.J.: Rowan and Allanheld, 1983).

from acts. Such theories assign instrumental value only to the acts themselves and intrinsic value to the consequences of those acts. In contrast, deontological ethical theories attribute intrinsic value to features of the acts themselves. Lying is wrong even when it produces better consequences than any of the alternatives.

INVIOLABLE RIGHTS VERSUS COMPENSATION

Under the ethical rules considered above, the relative merits of social states depend uniquely on the personal welfare characteristics of the persons who live in such states, without attention to considerations of rights. If two states generate the same personal welfare values for each person, under welfarism they must be treated in exactly the same way. As Sen has pointed out, intergenerational efficiency as defined under these ethical rules allows for the violation of human rights.²⁶ The idea of a right to remain unharmed by others can easily conflict with these rules.

Even if the future generation may be richer and may enjoy a higher welfare level, and even if its marginal utility from the consumption gain is less than the marginal welfare loss of the present generation, these factors may still not provide a decisive justification for rejecting intergenerational transfers when the alternative implies uncompensated long-term effects of pollution. As far as the Pareto criterion is concerned, the present generation could be well off and future generations starving and cancer-ridden—for example, due to stratospheric ozone depletion—in such a way that the future could only be made better off by making the present worse off.

The transfer of a set of “goods” may be unacceptable as an attempt to correct for loss or injury due to the violation of the rights of future generations. As Barry has stated, doing harm is in general not cancelled out by doing good.²⁷ Thus, if there is global warming, sea level rise due to the melting of the Antarctic ice sheet is not cancelled out by compensation from this generation to that. Compensation does not licence society to pollute, provided the damages created are less than the amount of compensation. Compensation cannot be used as an excuse to continue actions causing long-term environmental damages. One morally ought to recognize the rights of future generations.

But doing so introduces another question. Do future generations have not just rights, but also inviolable rights? The justification for rights of future generations is similar to the justification for rights of foreigners. Consider the export of toxic wastes from country *A* to country *B*. Country *A* wants to be rid of toxic wastes and pays country *B* to accept them. The rights of *B*'s citizens to have an environment free of toxic wastes is thus bought and sold. Should *A* act in this fashion? If *A* does not wish to have toxic wastes, neither should they be imposed upon other

²⁶ Sen, “Approaches to the Choice of Discount Rates for Social Benefit-Cost Analysis.”

²⁷ Barry, “Intergenerational Justice in Energy Policy,” p. 21.

countries. If *A*'s citizens have rights to a toxic-waste free environment, no matter how much *A*'s citizens may wish to have the benefits of the chemicals produced while ridding themselves of their wastes, these favorable circumstances cannot be bought by violating the same rights of *B*'s citizens. The same argument extends to future citizens of *B* or future citizens of *A*.

Many economists will object to this argument—which would ban international trade in toxic wastes—on the grounds that the contracting parties are entering into agreements of their own free will. However, there are many cases in which societies protect themselves from violation even by voluntary contractual agreement in order to protect intrinsic human values. One cannot sell, even if one wishes, the right not to be a slave, to freedom of speech, to freedom from torture, or to sue another party. Freely contracting children are protected from working in coal mines, despite the potential economic gains. From time to time some people may accept the loss of their rights if they can trade them for enough money. Nevertheless, we conclude that such rights ought not to be traded. They are inviolable—at least inviolable in terms of economic compensations.

Accepting an inviolable right of future generations to be free of intergenerational environmental damages has serious policy implications. If it were accepted, compensation would no longer be used to justify environmental degradation in violation of such rights, although there would still be some role for compensation. Irreversible damages, already underway, which could not be prevented by stopping pollutant emissions or other actions would require compensation. This approach is analogous to tort law, in which rights that ought not to be violated have been violated and compensation is undertaken to mitigate the wrong. There might be cases in which there would be uncertainty over the consequences of present actions, and, if harm did in fact result, compensation would be in order. However, all actions known to cause long-term environmental damages would have to be stopped. Under the rights theory that I am advocating here, the current generation would be obliged to identify all activities causing long-term damages and ban them regardless of the cost.

The picture I have sketched sets consequences against rights. However, things may be more complicated. We must raise the problem of conflicting rights across generations. Continuing activities that create long-term damage deny the future their right to an undamaged environment. Nevertheless, perhaps this generation has some right to the benefits that they are acquiring, the wastes from which will result in harm to future generations. Chlorofluorocarbon deodorant propellants have close substitutes and can be banned at little cost. Although we probably will not say that people have a right to aerosol deodorants, the same chlorofluorocarbons provide refrigeration, which is much desired in the third world, where people may claim that they have as much right as we do to such benefits. Not just the benefits, but the rights to such benefits explain why a ban against depletion of the ozone layer has consistently been resisted.

COMPENSATION AND JUSTICE AS OPPORTUNITY

The discussion of intertemporal allocations has evolved over time from the idea of splitting a fixed, finite cake to one of productivity and opportunity maintenance. This new approach moves the emphasis from a dividing up of a particular resource stock toward asking what welfare can be generated from some economic and political system that is given available resources and technology. Solow puts it this way: "The current generation does not especially owe to its successors a share of this or that particular resource. If it owes anything, it owes generalized productive capacity or, even more generally, access to a certain standard of living or level of consumption."²⁸

From this perspective, the problem posed by nonrenewable resources is not that future generations will have no slice of the resource, but that they will have fewer options, other things remaining the same, because a given technology and capital stock output will be lower and environmental degradation higher. Barry suggests that if we cannot save for them a slice of the pie as readily obtainable as ours, their reduced access to easily extractable and conveniently located resources be "compensated" via improved technology and increased capital investment.²⁹ Compensation in this sense provides for basic transfers, for what economists view as the maintenance of utility, or what we might call productive opportunities. We need to ask, if compensation is of that kind, whether perhaps rights will be protected after all.

The level of "compensation" being referred to here is restricted to maintaining a basic opportunity set, and therefore is appropriately regarded as a basic transfer. However, there is no particular reason to limit compensation for damages just to calculations about distributional transfers of this or that resource. The reference point for compensation is the level of damages caused to the individual, not the amount of some specific resource available to that person. The reference point for distributional transfers is the welfare level, difference in welfare, or opportunity set of the current generation compared to future generations.

To argue the matter in terms of productive opportunity fails to clarify the two strands of moral argument being made here. On the "rights" strand, future generations have the right to a certain welfare or opportunity to obtain that welfare. On the "consequences" strand, actions that harm future generations require that compensation be made or harmful activities stopped. It might at first seem that if we "compensate" for a reduced resource by an unreduced opportunity,

²⁸ Robert M. Solow, "On the Intergenerational Allocation of Natural Resources." *Scandinavian Journal of Economics* 88, no. 1 (1986): 142.

²⁹ Brian Barry, "Intergenerational Justice in Energy Policy," in Douglas Maclean and Peter G. Brown, eds., *Energy and the Future* (Totowa, N.J.: Rowan and Allanheld, 1983).

then rights have been protected. However, reducing the stocks of nonrenewable resources affects future generations in a different manner from the creation of long-term environmental damages. When the concern in the case of resource depletion shifts to the maintenance of basic transfers, it seems that rights are protected; nevertheless, that is not the full concern. The concern in the case of environmental damages is for reparations for the violation of the right not to be harmed.

Compensation (defined as making amends for loss or injury) implicitly involves an asymmetry of loss and gain. Long-term environmental damages entail an asymmetric distribution of loss and gain over time. Intergenerational compensation is the counterbalancing of negative transfers by positive transfers. Although this compensation requires the use of transfer mechanisms, all transfers need not be compensatory. For example, under an egalitarian ethical system the welfare level received from the previous generation should be maintained for the next generation. The current generation starts with a set of natural resources, environmental assets, capital, knowledge, and capabilities that can only be regarded as a means of compensation insofar as they can be used to increase, not merely maintain, welfare.

An example in the intratemporal context helps clarify the distinction being made here. Assume that there is an individual who receives government payments because he or she is unemployed and has no means of support. The government provides for him or her a minimal standard of living. Without these government payments the individual's welfare would be much lower. Assume that this individual lives next to a weapons factory run by the government. Unfortunately, there is on site a toxic waste dump that has been leaking radioactive materials into the local environment. The leak is discovered and there is a proven cause-effect relationship between the radioactive releases and the local high incidence of cancer cases. Our welfare recipient has developed cancer since living in the area. Can the government now say to this individual that he or she is so much better off already, due to the welfare payments that provide a minimal standard of living, that compensation for the cancer is not required? No, because the two kinds of payment cannot be morally linked. The welfare payments are made on the grounds of equity, and liability payments on the grounds of injury.

The analogy that I want to draw pertains to a common argument that the current generation need not be concerned over the loss or injury caused to future generations because they will benefit from advances in technology, investments in capital, and direct bequests. These are the transfers that society has deemed should be made to provide some minimal standard of living. Upon the discovery of long-term environmental damages, such as those from the greenhouse gases, this generation cannot turn to the future and state that it has no obligation for intergenerational compensation because basic transfers were supplied. Equity payments do not take care of liability responsibilities.

POTENTIAL AND ACTUAL COMPENSATION

Modern welfare economics is based upon the principle of "potential compensation." If the gainers from an action are able to compensate the losers, the action is an improvement regardless of whether compensation is actually paid. If compensation is actually paid, the principle is nothing more than the Pareto criterion.

Freeman has claimed that the Pareto criterion is not widely accepted by economists as a guide to policy and plays no role in "mainstream" environmental economics.³⁰ He goes on to state that the basis of cost-benefit analysis is the hypothetical compensation criterion that "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, according to this view, economists invoke as justification for the results of cost-benefit analysis the claim that they are potential Pareto improvements, while the Pareto improvements themselves are rejected! In effect, the potential compensation criterion is used only to claim that compensation *might* be made (even though it is supposedly not needed). The ethical implications of such a definition and use of efficiency are hardly acceptable.³¹ Hypothetical compensation is consistent with making the poor yet poorer.

A persistent view, especially among adherents of the positivist program, has been that economists should avoid evaluation and prescription. Talbot Page points out that applied welfare economists have largely limited themselves to one normative idea, efficiency, which is often regarded as being so universally appealing and analytically tractable that they scarcely think of it as being normative at all.³² From this perspective, the potential compensation criterion is viewed as being useful in separating efficiency and equity; however, discussions of actual compensation have been avoided on the grounds that equity issues are outside of the economists' realm. Page has argued persuasively against this view and for the consideration of equity and other normative concepts besides efficiency in applied welfare economics, especially where intergenerational issues are involved. Compensation is one of those other normative concepts which evokes more moral concerns than just equity.

³⁰ A. Myrick Freeman, "The Ethical Basis of the Economic View of the Environment," in Donald Van De Veer and Christine Pierce, eds., *People, Penguins, and Plastic Trees: Basic Issues in Environmental Ethics* (Belmont, Calif.: Wadsworth Publishing Company, 1986), pp. 218-27.

³¹ Edward J. Mishan, "Survey of Welfare Economics—1939-1959," in *Welfare Economics: Ten Introductory Essays*, 2d ed. (New York: Random House, 1969), p. 46.

³² Talbot Page, "Intergenerational Equity and the Social Rate of Discount," in V. Kerry Smith, ed., *Environmental Resources and Applied Welfare Economics: Essays in Honor of John V. Krutilla* (Baltimore: Johns Hopkins Press, 1988), pp. 71-89.

It is possible to devise ethical systems that permit no compensation. For example, under some of the ethical rules discussed earlier, long-term environmental damages and the associated need for compensation can be ignored. In order for no compensation to be made for actions causing long-term environmental damages, the current generation can be either (1) elitist with welfare dependent upon current consumption alone, coupled with the belief that future generations will be worse off or (2) utilitarian with the belief that the marginal utility of future generations will be lower for all levels of consumption. Under these circumstances, there will be no basic transfers either. Ethical systems requiring distributional transfers imply that compensatory transfers will be made when they are necessary.

Economists have failed to confront the ethical implications of discounting. As a result, intergenerational damages are accepted without much concern. When long-term damages are acknowledged and taken into account, they are weighted so as to be less important than present benefits. If the damages, after they are weighted, are still significant enough to warrant compensation, this concern, economists hold, can be dispelled either by the potential compensation criteria or by the existence of basic transfers. In contrast, I have argued that neither of these is ethically adequate. Two fundamental steps forward would be to recognize the need for actual compensation when there are damages and to start considering the intrinsic, inviolable rights of future generations.