Sources: Ward Thomas, "Victory by Duress," *Security Studies*, vol. 15, no. 1 (January–March 2006); Robert A. Pape, *Bombing to Win: Air Power and Coercion in War* (Cornell University Press, 1996); Air Force Doctrine Document 2-1.2, *Strategic Attack* (1998 and 2007); United States, Navy/Marine Corps/Coast Guard, *The Commander's Handbook on the Law of Naval Operations*, NWP 1-14M, MCWP 5-2.1, COMDTPUB P5800.7 (1995); *International Law Studies* 73, ed. A. R. Thomas and James C. Duncan, *Annotated Supplement to The Commander's Handbook on the Law of Naval Operations* (Naval War College, 1999); Michael N. Schmitt, "Fault Lines in the Law of Attack," in *Testing the Boundaries of International Humanitarian Law,* ed. Susan Breau and Agnieszka Jachec-Neale (British Institute of International and Comparative Law, 2006); U.S. Army Field Manual 27–10, *The Law of Land Warfare*; *1977 Geneva Protocol I*, Art. 52:2; Frits Kalshoven, "Noncombatant Persons: A Comment to Chapter 11 of the Commander's Handbook on the Law of Naval Operations" in *International Law Studies* 64, ed. Horace B. Robertson, Jr., *The Law of Naval Operations* (Naval War College, 1991); Jean-Marie Henckaerts and Louise Doswald-Beck, *Customary International Humanitarian Law*, vol. I: *Rules* (Cambridge University Press for the ICRC, 2005); *1954 Hague Convention for the Protection of Cultural Property in the Event of Armed Conflict*, Art. 8; United States Department of Defense, Military Commission Instruction No. 2, "Crimes and Elements for Trials by Military Commission" (April 30, 2003), para 5D; United States Department of Defense, JP 3-60, *Joint Doctrine for Targeting* (January 17, 2002), Appendix A, "International Law and Legal Considerations in Targeting"; United States Army, Judge Advocate General's Legal Center and School, International and Operational Law Department, *Operational Law Handbook* (2006, 2007, 2008); United States Air Force, JP 3-60 (April 13, 2007), *Joint Targeting*, Appendix E, "Legal Considerations in Targeting"; Joy Gordon, *Invisible War: The United States and the Iraq Sanctions* (Harvard University Press, 2010).

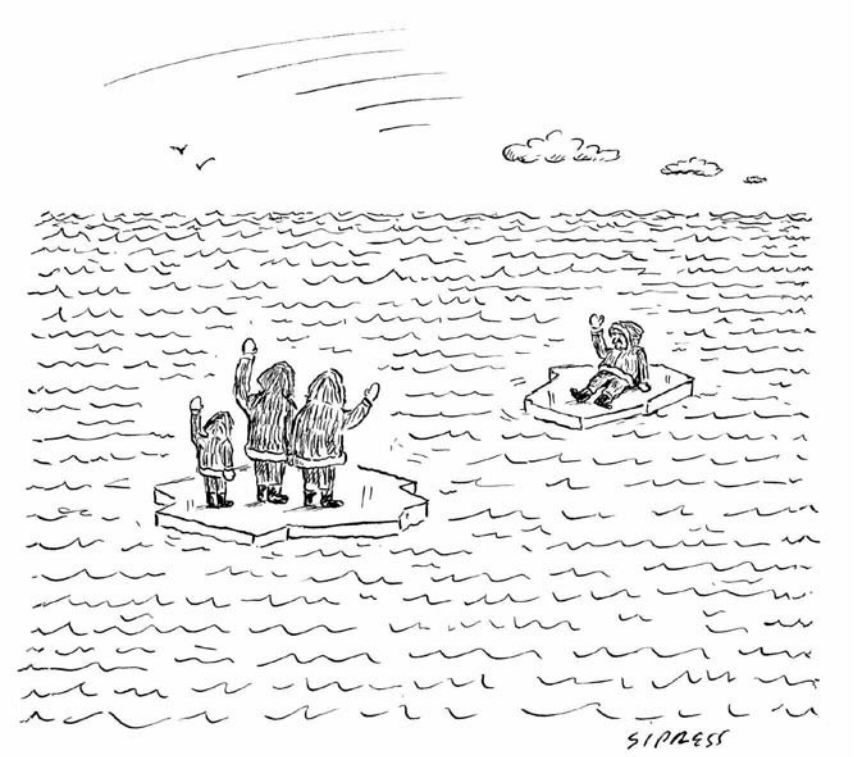
The Poverty of Economic Reasoning about Climate Change

Mark Sagoff

A *New Yorker* cartoon illustrates the intergenerational aspect of climate change. It shows an Eskimo mother, father, and young child as they wave a tearful farewell to an old man, presumably a grandparent, whom they have placed on an ice floe. The family itself stands on a floating piece of ice. Which generation is responsible for the plight of which?

I want to argue that the intergenerational aspect of climate change makes economic reasoning about it more problematic than one might think. Economic analysis depends on the idea of trade or exchange. It is hard to see, therefore, how it applies to our relations to people in the further future. We cannot bargain with them or they with us. Since they do not yet exist, they cannot have property rights. If ability to pay is a prerequisite of willingness to pay (WTP), moreover, then future generations cannot be willing—because they are not able—to pay us anything. We have exhausted all possible "benefits of trade" with them.

I shall argue that the passivity of future generations—their inability to exercise market or political power—makes economic analysis irrelevant not just to justifying the goals of climate policy but also to designing instruments to achieve those goals. Economists often recommend that an international authority "cap" global greenhouse gas (GHG) emissions but allow firms to trade "allowances" under that cap. I shall argue that such a regime cannot succeed because gen-



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erations in the further future, who are its principal beneficiaries, are in no position to defend it. Trading in GHG "allowances," as I shall argue, is more likely to reflect beliefs about the likelihood of enforcement—bets placed on election returns, for example—than to reveal the marginal cost of "sustainable" production or "clean" energy technology.

A perfectly efficient or competitive market cannot respond to the need of future generations for a stable climate because future generations play no role as market actors. An efficient policy therefore cannot be a sustainable policy. This is an argument against efficiency, not against sustainability. That economic theory fails in this way suggests we must rely on other reasons and rationales to justify a response to the threat of climate change.

Climate Change Is Not a Collective Action Problem

According to Paul G. Harris, "Climate change is a collective action problem *par excellence*." One can see the appeal of this analysis. In 1965, Mancur Olson in *The Logic of Collective Action* showed that when each individual acts on self-interest, for example, to "free-ride" on the more socially motivated action of others, public goods will not be produced. Olson defines a "group" as "a number of individuals with a common interest." Olson wrote, "Unless the number of individuals in a group is quite small, or unless there is coercion or some other special device to make individuals act in their common interest, rational, self-interested individuals will not act to achieve their common or group interests."

A little reflection, however, suggests that the "tragedy of the commons" or the analysis of a collective action problem does not fit the challenge of climate change. In the typical collective action problem, such as managing an open-access commons or preventing defections in a "prisoner's dilemma" game, each person will gain if all cooperate and all will lose if each acts in his or her own individual self-interest. In the case of climate change, however, one group, that is, people alive today and through the next generation, will make significant sacrifices, for example, by forgoing the consumption of inexpensive fossil fuels. A completely different group, whom one might call "posterity," will benefit.

The coercion necessary to solve a collective action problem is justified by the mutual reciprocity of advantage, that is, the idea that each person gains more by the restriction of the freedom of others than he or she loses by accepting that same restriction. In the context

of climate change, however, the winners and the losers are different—so different, in fact, that we who make sacrifices (or accept restrictions) may be long gone before posterity appears to enjoy the fruits of the sacrifices we make for them. If one assumes—as I shall for the sake of argument—that we who make sacrifices to mitigate climate change will all be dead before those who benefit from our sacrifices appear, no relevant "common interest" exists to establish a collective action dilemma. This hardly implies that we have no responsibility for the further future. The justification for sacrifice, however, would seem to lie in extraordinary altruism rather than in enlightened self-interest.

I am hardly the first to argue that climate change cannot be analyzed in terms of the logic of collective action. Stephen Gardiner, for example, has noted that climate change represents a lagging phenomenon "because some of the basic mechanisms set in motion by the greenhouse effect—such as sea level rise—take a very long time to be fully realised." Because of this, the mechanism of coercion mutually agreed-upon is unavailable. The obstacle to bargaining "arises because the parties do not coexist, and so seem unable to even influence each other's behaviour through the creation of appropriate coercive institutions."

The irrelevance of the logic of collective action to climate change becomes even more apparent when we reflect that we have no way to control the behavior of future generations. Even if we conceive of them as partners in arranging a system of controls that greatly reduces GHGs, there is no way to bind them to whatever discipline we manage to exert over ourselves. We have to "go first" in this game. They could "defect" and thus undo what we had done.

An Objection

To this argument a reader might object that a collective action problem arises because we can act individually to provide our great-grandchildren some things, like trust funds, but not other things, like a stable climate. A collective action problem, however, arises only if two conditions are met: 1) individuals can achieve some common goal together that they cannot achieve alone; and 2) each gains more from the sacrifice of others than he or she loses from making the same sacrifice. To see the importance of the second condition, consider the example of light pollution. We would all like to be able to see the stars at night—but in cities we cannot because there is too much diffused light pollution from household illumination, street lights, and headlamps. If I turn out my lights and wander about in the dark, I do little to restore the splendor of the stars. Since everyone is in the same situation, we might seem to have a collective action problem. To see the stars in all their glory, we all have to turn out our lights—car lights, street lights, and house lights. Is the collective gain worth the individual cost? People may not think it worth the candle—in other words, they might rationally believe that the collective benefit of a magnificent starscape is not worth the individual cost of stumbling around in the dark.

That we have less to gain than to lose in our well-being by taking the steps necessary to mitigate climate change is not to conclude that we lack the political will to embrace policies needed radically to reduce "greenhouse" emissions. As Roger Pielke, Jr., has argued in his recent book, *The Climate Fix*, "political will for action on climate change is and has been strong enough for action to occur." To see that political will exists, one has only to look at the daily newspaper where stories and advertisements describe private, local, regional, and corporate initiatives to move to "green" technologies. There are also significant public subsidies for them.

According to Pielke, all kinds of actors are engaged in finding ways to abate climate change for all kinds of reasons—but they do not share any single view, analysis, interest, or strategy. It is counter-productive for the expert or academic community to try to impose one. The challenge, as Pielke has written, is to "design policies that are consonant with public opinion, and are effective, rather than to shape public opinion around certain policies." Pielke refers to the wisdom of the pragmatist Walter Lippmann who counseled that the political goal is not to get everyone to think alike – to fall behind the same theory or academic opinion—but to get those who think differently and have different concerns to act in the same overall cause.

Climate Change Is Not a Market Failure

One academic theory of climate change that does not help calls it a "market failure." In a much discussed report issued in 2006, British economist Nicholas Stern described climate change as "a unique challenge for economics: it is the greatest and widest-ranging market failure ever seen." William Nordhaus stated, "Emissions of carbon dioxide are externalities, i.e., social consequences that are not accounted for in the market place." Jonathan Weiner described climate change as "a classic market failure, an 'externality' that ordinary market operations and voluntary behavior will not correct." Law professor Jedediah Purdy has written, "Climate change threatens to be, fairly literally, the externality that ate the world."

Is climate change a market failure? A market fails when it does not implement all the gains that can be achieved through trade. A market that implements all the gains that can be achieved through trade may ignore the interests of those who cannot trade. Individuals not yet born cannot trade. An efficient market, then, may ignore the interests of later genera-

tions except insofar as people for purely altruistic reasons are willing to put those interests before their own.

The idea of market exchange or market activity—and therefore the model of market failure—depends on the existence of willingness to pay (WTP) to acquire goods and willingness to accept (WTA) compensation to relinquish them. An economist who asked respondents how much they would accept as payment from future generations to mitigate GHG emissions could not expect an answer. There is no way future generations can pay us (or give us incentives) for what we do.

Economists generally define an "externality" as a cost (or benefit) to anyone who has not been paid (or has paid) for it. At first glance, one might think that today's emissions cause tomorrow's externalities, even if "tomorrow" does not come for a very long time. A deeper look, however, suggests that externalities arise only if those involved could at least in principle bargain to resolve their conflicting interests. Generations yet unborn do not meet this condition.

In an influential analysis, Ronald Coase argued that the fundamental reason that externalities arise lies in the "bargaining" or "transaction" costs parties who suffer them would have to bear to enter or influence the activities or decisions that affect them. Richard Zerbe and Howard McCurdy have written, "The externalities on which market failure analysts tend to focus are defined by transactions costs. In essence, externalities exist because the transactions costs of resolving them are too high. In this sense, every story about externalities and market failures is also a story about transactions costs."

What kind of story about transaction costs explains climate change as an "externality" or as a market failure? In the usual case of pollution, one may refer to the costs of bargaining with or bringing a legal action against a polluter. With climate change the problem is that the victims do not yet exist and thus that the concept of a transaction cannot apply. If there cannot be a transaction there cannot be associated costs, however large or even infinite. Because no one can tell a plausible story about market exchange or transaction costs, no one may be able to show that climate change is a market failure at least as Coase understood that concept. This may have more to do with metaphysics than with markets.

The essential problem is that future generations play a passive role in our decisions. We can affect them, but they cannot affect us. They are epiphenomenal. Our relation to them is not a market relationship but an ethical, political, or spiritual one. A market analogy—the idea of market failure—provides a poor model for understanding climate change and might have the untoward effect of misleading us about the motives and reasons that justify GHG limits. Since future generations do not exist, they cannot pay for anything. Nor can they accept payment. Nor are they likely to be able and thus willing to pay us anything when they come into being because they will not be able to find us (whatever they pay in "travel costs") or by that payment alter what we had already done. To invoke a market-based justification may be to defeat regulation.

Property Rights

Consider the hoary example (associated with the British economist Arthur Pigou) of the damage done to a woods by sparks from railway engines. The operator of the railroad owns the right to use the woods in this way—as a catchment for engine sparks—as long as there is no legal rule against it and the wind blows the sparks this way or that. One may regret that things work this way; if one owns the forest one might sue the railroad to enjoin the sparks—but the right to emit belongs to the railroad until it is taken (by a legal judgment, for example) and awarded to the owner of the forest. Where the right lies is not a "natural" fact but a legal judgment.

Since future generations do not exist, they cannot pay for anything. Nor can they accept payment. Nor are they likely to be able and thus willing to pay us anything when they come into being because they will not be able to find us.

Both the railroad owner and the forest owner have rights to use the forest for different purposes as long as these are consistent. Because the land cannot in fact be used simultaneously to catch sparks and grow trees (let us assume), these rights conflict. The forest owner sues. Whether the courts impose an injunction, award damages, or just let the chips (or sparks) fall where they may is a question to be answered through the incremental wisdom of common law. One cannot show within economic theory that one party (the forester) really or naturally "owns" the right to its use of the forest, while the other creates an illegitimate "externality." As Coase argued, it takes two to create an "externality"—the forest owner contributes by insisting on growing trees, for example, just where the railroad engine throws sparks. Each side has an equal property right—the legal system or the government does not create the right asserted by the railroad owner or by the forester but decides which of these uses prevails when they conflict.

Now consider the analogy between the Pigouvian railroad and climate change. The GHGs we emit will harm future generations just as the sparks the railroad emits harm the forester. This tells us nothing, however,

about property rights. These have to be adjudicated; they are not determined by God or found in nature. The relevant property rights belong to those who use them—emitters of GHGs included—until a judgment, rule, or settled expectation decides which right should prevail. The legal, social, and political institutions that typically adjudicate conflicts, however, are not good at recognizing future generations. This may be explained in part because of the impediments that prevent one generation from suing another.

In liberal political theory, property rights to unowned aspects of nature are associated with priority of acquisition and with the labor needed to develop wild lands and raw materials. John Locke in the 17th century stated his famous "proviso" that no one should take resources out of the commons except if there were as much and as good for others—or "no prejudice to any others." This restriction has been repeated. For example, Michael Otsuka has written, "You may acquire previously unowned worldly resources if and only if you leave enough so that everyone else can acquire an equally advantageous share of unowned worldly resources."

The legal, social, and political institutions that typically adjudicate conflicts, however, are not good at recognizing future generations. This may be explained in part because of the impediments that prevent one generation from suing another.

Who does "everyone else" include? If "everyone else" includes all future generations, then there is a paradox. At some point at least in the distant future virtually any currently unowned resource may become scarce. If one had to assure an "equally advantageous share" to future potential claimants, no one might ever be able to acquire anything from the commons. But if one had to assure the share only of contemporary claimants, then possibly catastrophic acquisitions or alterations of the commons that have long lag times or long-delayed effects may be permitted.

Future generations may not have claims against those who acquire or privatize unowned resources even when this may be prejudicial to them. This seems to be the view of Hugo Grotius (1583–1645): "[H]e who is not yet born, can have no right, as that Substance which is not yet in Being has no Accidents. Wherefore if the People (from whose Will the Right of Government is derived) should think fit to alter that will, they cannot be conceived to injure those that are unborn, because they have not as yet obtained any Right." According to Matthias Risse, Grotius held that "the domain of what is commonly owned simply is whatever is left to any given generation. It is up to each generation how much it leaves behind." This seems as far as market-based notions and thus economic analysis may take us. We must look to ethical concepts, such as equity, not to efficiency to find a plausible basis for dealing with climate change.

Consider an analogy. My neighbor at the top of the road maintains a magnificent garden which I enjoy each time I drive by it. I believe I have the right to gaze at her garden—a property right, if you will, in that use of it. What is wrong with that? Is it that I fail to compensate her for her efforts? That I have not reached an agreement with her beforehand? It is clear that she owns her garden from the point of view of the land and I own it from the point of view of the spectacle, at least when I view it. Since there is no conflict between her using the garden to putter and my using it to admire, we keep our rights and nothing is done to characterize or codify them.

Now suppose that scientists found out that when passersby admire a garden they deplete it in some way so that gardeners a hundred years from now will have to plant different kinds of flowers to withstand further admiration or build high walls to keep admirers from seeing them. At that point we face a puzzle. How should we deal with the conflict between my admiring the garden now and the ability of my neighbor's great-grandchildren (if they still live in the house) to raise the same sort of flowers or to do so without building high walls? Do homeowners in the further future have a right to grow the kinds of gardens we grow now in the places we grow them? How do these future people claim or exercise those rights? How do these rights cancel my own—turn my enjoyment of the garden from a right into an uncompensated harm or an "externality"? To be sure I have no right to harm my neighbor, but my enjoyment of her garden is harmless to her. I do not share the environment with future generations as I do with my neighbor. It is unclear how I share the environment with them.

Cap and Trade

I have argued so far that climate change cannot usefully be diagnosed in economic terms, for example, in terms of a collective action problem, a market failure problem, or a problem in defining and exchanging property rights. One can concede this and propose nevertheless that a market model should inform our response to climate change. Let us say that society decides to limit or "cap" GHGs to an "acceptable" level. One could contend that a market should be constructed to allocate efficiently the emissions that are allowed under the "cap."

So much has been written on the "cap and trade" strategy of reducing GHG emissions that one hesitates to add another word. It may be worth noting neverthe-

less that the same deficiency—namely the passivity of future generations—that defeats the market failure model as a means of justifying a "cap" also defeats the attempt to trade "allowances" under that cap. Future generations, who are the beneficiaries of the "cap," can do nothing to defend it. In the absence of their political support, prices of "allowances" may reflect not the marginal costs of GHG abatement but the bets speculators place on whether a regulatory regime will be sustained.

All our experience with "cap-and-trade" regimes confirms this. For example, the 1990 Amendments to the Clean Air Act instituted in the United States a "trading" mechanism among power plants for emissions of sulfur dioxide (SO_2), a gas associated with acid rain and damage to forests among other problems. Advocates of cap-and-trade strategies such as Wiener often appeal to "the SO_2 allowance trading system to control acid rain . . . and the subsequent success of that program: it reduced emissions faster than expected, at far lower costs." The reasons that SO_2 emissions fell faster than expected and at lower costs, however, had little to do with the "trading" mechanism inaugurated under Title IV of the 1990 Clean Air Act Amendments.

Emissions of SO_2 fell over the last two decades chiefly because power plants, previously mandated to install scrubbers needed to protect the market for high-sulfur or "dirty" coal, were allowed flexibility in the means they used to achieve regulatory limits. The cost of transporting low-sulfur from Wyoming's Powder River Basin fell by half as a result of railroad deregulation. According to one study by Burtraw and Szambelan, "flexibility to use low-sulfur coal was responsible for about 80 percent of the decline in marginal abatement costs, while technical change was responsible for about 20 percent." There is no evidence that R&D led to any patents or other signs of invention as a result of the SO_2 trading program. Power plant operators relied on familiar and proven technology—

not on innovation—to make mandated reductions. According to A. D. Ellerman, "What emerges from the experience with Title IV is that [abatement] costs are lower for reasons beyond the ability to trade emission reductions." The reductions of SO_2 achieved under Title IV did not result from the "trading" mechanism and, even if they did, this would tell us nothing about its relevance to mitigating the far more complex (and global) challenge of climate change.

What makes the SO_2 experience relevant, however, is the extent to which the prices of sulfur allowances blew like straws in winds of politics and litigation. If SO_2 markets teach any lesson, it is that the price of an allowance is likely to vary less with the marginal cost of abatement than with the uncertainty of future enforcement. "There is strong evidence of the close connection between regulatory uncertainty and structural shifts in allowance market prices," Dallas Burtraw has written of market-based approaches to both SO_2 and nitrous oxide (NO_x). "Recently the SO_2 and NO_x markets have been volatile and prices have fallen precipitously. These programs have been undermined by substantial regulatory uncertainty."

The short history of the European Union Emissions Trading Scheme (ETS) for GHGs, inaugurated in 2005, teaches the same lesson. For trading to affect behavior, firms that emit GHGs must not simply hold or "bank" allowances to comply with regulation but generate them for sale by developing ways to reduce emissions. They will do this only if they believe that allowances will have economic value. This economic value, in turn, will depend on how many allowances political authorities may create and how earnestly laws will be enforced.

During the first phase of ETS trading (2005–2007), gross over-allocation of allowances caused prices to plunge; in 2007, they dropped effectively to zero. This suggests that over ten years the Kyoto Protocol, which established the cap-and-trade system for Europe, did essentially nothing. After all, in 2007 emission allowances were nearly free and prices have remained low owing to "heavy selling and a realisation that the market was oversupplied with allowances," according to the Point Carbon report. Generations in the further future cannot enter the market to retire allowances no matter how much they would be worth to them. After the failure of an international meeting at Copenhagen and in view of impasse in Congress, the price of an allowance cannot overcome skepticism.

The basic problem is that GHG allowances are created out of political whole cloth and allocated accordingly. There is an unlimited supply of this fabric. Proponents of cap-and-trade approaches believe that political actors will agree on a way to limit the number of allowances they create and on a way to allocate them acceptable to all parties. This belief may represent the most heroic "assumption of the can-opener" in the history of economic thought. This is not to say that the world lacks the political will to develop GHG-mitigating technologies. The will is there—but this political energy may be stifled by the overlay of academic and expert opinion of how to analyze the problem and therefore how to tackle it. To insist on cap-and-trade regimes when they are not backed by political will is to distract from and impede the task of GHG mitigation.

Conclusion

I have argued that economic theory cannot provide a useful way—either a model, method, or metaphor—to think about climate change. Climate change is not a collective action problem because individuals today have no common interest that would lead them to believe they have more to gain overall as individuals from the restrictions placed on others than they have to lose from accepting those restrictions themselves. There is no common interest among agents or reciprocity of advantage of the kind that a collective action problem requires.

I have argued that economic theory cannot provide a useful way— either a model, method, or metaphor —to think about climate change.

I have also argued that climate change cannot be understood as a market failure since no market relationship could possibly engage present generations with those in the further future. Nor can the problem plausibly be understood in terms of the allocation or distribution of property rights since there is no theory on which to ascribe property rights to hypothetical individuals who lack existence, agency, and identity. Future generations could no more assert property rights against us than we might assert property rights against those who preceded us. Whatever we choose to leave to future generations is all they may claim to possess.

I have also argued that cap-and-trade approaches must fail because governments can write "allowances" like scrip. Politicians might show some restraint if future generations made it worthwhile for them to do so, for example, by hosting fundraisers or helping to get out the vote. This is unlikely to happen. In order to get "buy in," political authorities must buy out interest groups. The buy-out might include everything from giving "hot air" allowances to the Russians to creating "offset" opportunities for questionable "green" projects to "grandfathering" rights for BP and Exxon. This is more like a feeding frenzy than like a crash diet.

Future generations represent the constituency that is most affected by climate change and whose interests

are the most served by policies intended to mitigate it. They do not vote. They do not trade. They do not exist. Any economic model that is consistent with its own normative presupposition—the idea of exhausting the benefits of trade—must conclude that they do not count. Insofar as a strategy to control climate change is based on ideas such as property, exchange, markets, WTP, efficiency, and the like, it may conceptually lead nowhere—except perhaps to despair—if applied to the problem of regulating GHGs in response to the threat of climate change. What one generation owes another—if we analogize future generations to separate populations that replace each other—is more reasonably analyzed in terms of moral attitudes ranging between indifference and altruism than in terms of economic concepts such as efficiency and exchange.

There are plenty of good reasons to care about future generations and to reduce GHGs, but these reasons elude economic thought. An ethical view of the matter—one that invokes responsibility, decency, compassion, and justice—will go further than price theory to take the interests of future generations seriously. This is just the difference between ethics and economics.

Mark Sagoff
Institute for Philosophy and Public Policy
University of Maryland
msagoff@umd.edu

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