

**Laissez Faire, Collective Control or  
Nationalization of the Global Commons**

by

**Richard S. Eckaus**

**MIT-CEEPR 92-014WP**

**October 1992**

MASSACHUSETTS INSTITUTE  
OF TECHNOLOGY

SEP 05 1996

LIBRARY

LAISSEZ FAIRE, COLLECTIVE CONTROL OR NATIONALIZATION  
OF THE GLOBAL COMMONS

Richard S. Eckaus  
Department of Economics

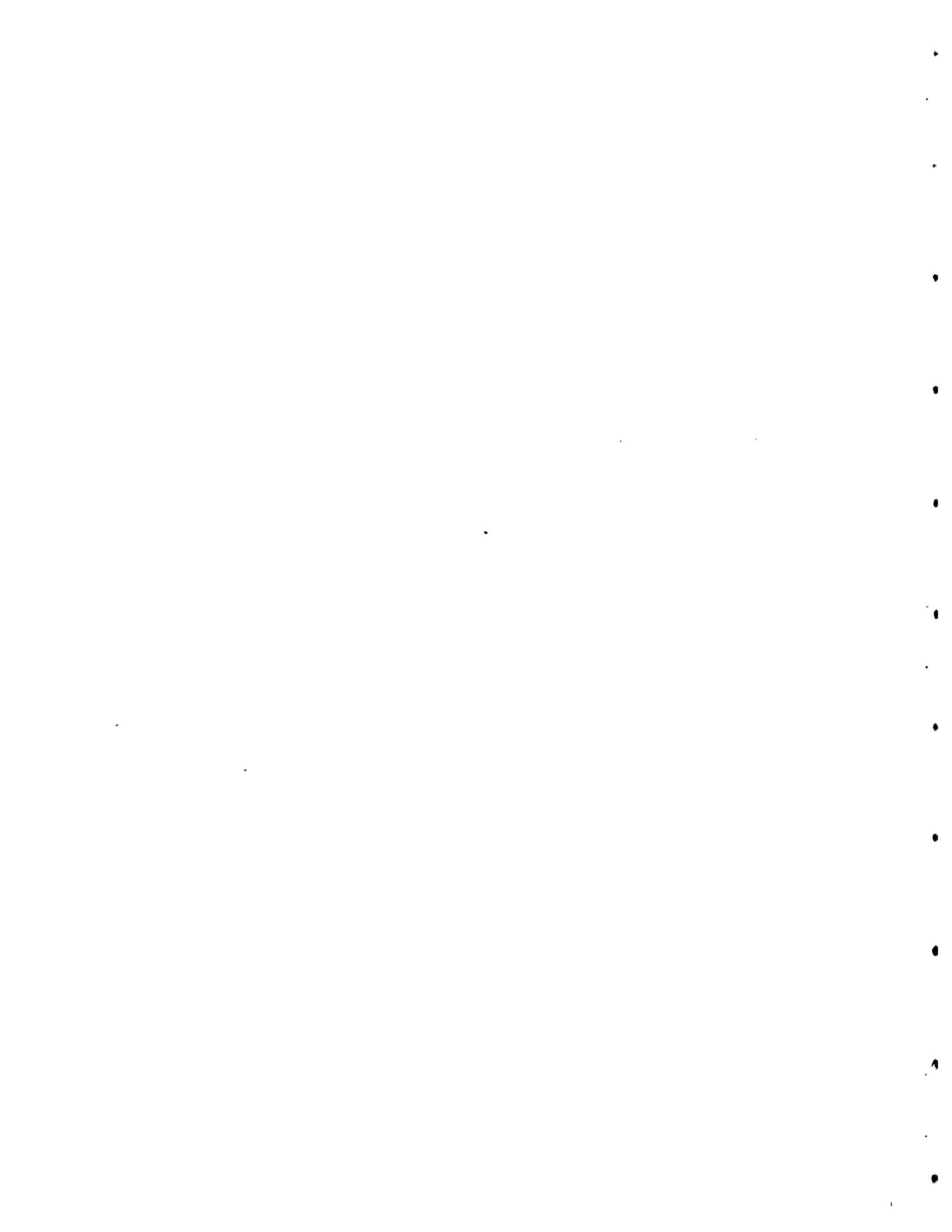
Center for Energy and Environmental Policy Research

M.I.T.

Cambridge, Mass. 02139

October 6, 1992

This paper is an extensive revision of a paper previously circulated under the title, "Central Issues in Greenhouse Warming Negotiations." The research on which this paper is based was supported by the Center for Energy and Environmental Policy Research, The Rockefeller Foundation and the National Science Foundation. None of these organizations bears any responsibility for its contents, however.



## ABSTRACT

### LAISSEZ FAIRE, COLLECTIVE CONTROL OR NATIONALIZATION OF THE GLOBAL COMMONS

Richard S. Eckaus

The use of the atmosphere as a dumping place for greenhouse gases has been a matter of laissez faire. Proposals for an international agreement to restrict the rate of such emissions are, in effect, proposals for collectively determined controls. The alternative proposed here is, "nationalization," which would give each country a share in the global carrying capacity and allow each country to determine the timing and best use of its share.

The advantage of nationalization of the global commons is that it would allow each country to determine its own path toward its allocated accumulation level, rather than having that path determined by international negotiations or an international authority. There is a prima facie case that, in general, countries can make better decisions for their own welfare than can international authorities.

The allocation of shares in global carrying capacity according to the population size of each country, with debits for previous accountable emissions would be a means of achieving international equity. If the allocation were based on populations in some post World War II year, say, 1950, it would recognize the fact that most developing countries became responsible for their own economies only after achieving independence from colonial rule. This rule would also carry an implicit penalty for high growth rates of population and emissions since 1950.



R.S. Eckaus  
Oct. 6, 1992

## I. Introduction

Laissez faire has prevailed in the use of the atmosphere as a freely available dump for the greenhouse gas emissions that contribute to global warming, until very recently. The new view, embodied in the United Nations Framework Convention on Climate Change, is that, "something must be done quickly," to control the rates of greenhouse gas emissions. However, it is not the rates of emissions which should be the primary focus of policy. The prior issues are, first, the acceptable atmospheric concentrations of greenhouse gases and resulting climate change and, second, the means of governance that will be used to enforce those ceilings.

The alternative proposed here to international collective controls administered through the United Nations is the nationalization of the decisions with respect to the accumulation of greenhouse gases through the allocation of shares in the "global carrying capacity" or "global commons" to individual countries. This approach, while sharing some of the problems of collective control, would deal more explicitly and more effectively with the fundamental resource problems of both efficiency and equity.

In the design of global climate policy, as with other commons problems, it is the commons, itself, that should be the central focus of negotiations. This contrasts with the terms of current analysis and debate and the international negotiations. It is true that the United Nations Framework Convention on

Climate Change starts with, "the ultimate objective of...stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system." Yet that level is not specified, nor even referred to again in the document, which focuses exclusively on controlling rates of emissions. That maintains the practice of the preceding negotiations which were carried on in terms of rates of emissions of greenhouse gases.<sup>1</sup>

Controlling the rate of emissions is an instrument of policy, rather than a goal in itself. It is an instrument that can be used rationally only if the goal, which is control over world climate change, is clear. Thus, control of emissions rates should be the second step toward an international policy, not the first.

It will be assumed in the following discussion that greenhouse warming, even if not imminent, is, in fact, a potential danger. However, it will be necessary to consider at a later point, the implications for international negotiations and atmospheric governance of the many unresolved scientific uncertainties. There are also unresolved questions as to what the social and economic costs would be of imposing reductions in greenhouse gas emissions. It will also be assumed here, that

---

1 For example, in the February meeting of the International Negotiating Committee of the United Nations, Working Group I was established to, "deal ... with commitments for limiting and reducing greenhouse gas emissions." (UN Chronicle, XXVIII, (2) June, 1991, p. 57.)



these costs and the benefits of avoiding greenhouse warming are both substantial, otherwise there would hardly be an issue to negotiate. The nature and implications of uncertainties with respect to these issues will be considered.

## II. The character and use of the "global commons"

The atmospheric concentrations of greenhouse gases and their global warming consequences depend not only on past emissions, but also on their atmospheric chemistry, their decay rates and reabsorption. The term "global carrying capacity", which has been used rather loosely, can be given a somewhat more precise definition as a particular feature of these response characteristics: the maximum atmospheric concentrations of greenhouse gases consistent with avoidance of significant climate change. In a rather misleading terminology, which will, nonetheless, be used, as it has become so universal and is so convenient, it is also the "global commons". Because of its literal associations, it must be emphasized that the global commons is not defined directly, analogously to land area or ocean surface. Rather it is characterized in terms of the overall relationships between greenhouse gas concentrations and radiative forcing.

Although the terminology of "commons" is applied to these complex interactions, it is certainly not a conventional use of the term and some discussion of it is warranted as the analogies that it suggests can be misleading. Common property lies between the extremes of individual ownership and control, on the one hand, and an asset or feature which belongs to and is controlled

by no one. Historically, "common" property has been owned and controlled by a particular group, with the rights of the group, as a whole, and of the individuals using the property being more or less clearly specified. By comparison, ownership and control of the response characteristics of the earth, atmosphere and oceans is not now located in any group, so it is neither common nor private property.<sup>2</sup>

The benefits of common property may be more or less unlimited or finite and "subtractive", so that the greater the use by one, the less available for others. The latter have been called, "common pool," resources.<sup>3</sup> The same resource may even move from one category to the other, depending on the intensity of its use. That is true, for example, of waterways and highways, for which, at low utilization intensities, an additional user will hardly reduce the benefits obtained by other users. At higher use intensities there will be congestion and, possibly, degradation of the resource.

There is a similar phenomenon with respect to atmospheric carrying capacity, which provides benefits as a convenient dump

---

2 There is a modest analytical literature in economics on common property, most recently associated with the problem of ocean fisheries management, and, of course, a substantial historical literature. On the former, see, G.H. Scott, Economic Theory of A Common Property Resource: The Fishery, Journal of Political Economy, 63, 1955 and D. Levhari and L. Mirman, "The Great Fish War," Bell Journal of Economics, 11, 1980.

3 Cited in W. Blomquist and E. Ostron, "Institutional Capacity and the Resolution of a Commons Dilemma," Policy Studies Review, 5, (2), 283-293.

for greenhouse gases. It has a natural regenerative capability, beyond which greenhouse gases accumulate with potential global warming effects. As a climate moderating feature, the global commons provides benefits - or disbenefits - to all, but, as will be noted, in quite different ways.

The fact that a resource is a common property does not mean that its benefits will necessarily be distributed equally or equitably. First of all, the distribution of benefits may have no connection or only a loose connection with the locus of control, but, rather, depend on the intrinsic nature of the commons. For example, the world's whale population has been made into a kind of common property by international agreement. The benefits from the controlled hunting of whales depend, in part, however, on where the whales swim, which cannot be controlled. Secondly, the differences in the benefits of common property stem, in large part, from the need for complementary inputs. Countries with more ships to catch the whales and farmers with more cows to put on the village common lands get a larger share of the benefits of each type of commons.

The developed countries of the world, which have pumped the overwhelming portion of greenhouse gases into the atmosphere, have, to date, been the main beneficiaries of its ability to absorb these gases. This is the source of the argument from some developing countries that the developed countries should bear

most of the burden of adjustment to lower emissions of greenhouse gases.<sup>4</sup>

A less clear, but potentially important example of unequal distribution of the disbenefits or costs of climate change has its source in the prediction by global climate change models of substantial differences in the global distribution of air temperature changes, precipitation changes and soil moisture changes due to a doubling of carbon dioxide in the atmosphere.<sup>5</sup> These models project much larger changes in temperature in the higher northern and southern latitudes than in a wide belt around the world that encompasses most of the developing countries of the world. With somewhat less uniformity, the same is true of projections of soil moisture and, with even less uniformity, of precipitation. Although there are many uncertainties associated with such predictions, they suggest that global warming, itself, would occur to a lesser degree in most developing countries than to the industrialized countries, although the consequences could nonetheless, be more severe.

### III. Alternative means of managing the global commons

-----

4 The United Nations Framework Convention on Climate Change states that, "the largest share of historical and current global emissions of greenhouse gases has originated in developed countries," (p.2) and, "the developed country Parties should take the lead in combating climate change and the adverse effects thereof," (p.6).

5 J.F.B. Mitchell, S. Manabe, T. Tokioka and V. Meleshko, "Equilibrium Climate Change," in J. T. Houghton, G.J. Jenkins and J.J. Ephraums, Climate Change, Cambridge U. Press, N.Y., 1990, pp. 131-1782.

The fact that a resource is a common property does not necessarily dictate a particular method for managing its use. Common properties may be used within the community on an individually laissez faire basis, be managed by community controls, including the trusteeship of an individual leader, or may be allocated more or less permanently to be used by a particular individual or group. Examples of all of these systems can be found, with laissez faire, perhaps being more exceptional than implied, for example in Hardin's celebrated article.<sup>6</sup>

The international negotiations on climate change can be regarded as an attempt by the world community to convert the global carrying capacity for greenhouse gases into the common property of the international community of nations with rules for its use. Much of the reasoning about global carrying capacity as a commons has been by analogy with the medieval village commons lands, to which Hardin made reference. Yet not all types of commons present the same problems in achieving efficient and equitable management. There was, in fact, great variation in the management of village commons and there is no a priori reason to believe that the characteristics of medieval village common lands make any of their administrative practices a model for the management of the global greenhouse gas carrying capacity. Moreover, although the focus has usually been on efficiency, the his-

---

6 G. Hardin, "The Tragedy of the Commons," Science, 162, 1243-8.

torical debate in England over the, "engrossing of the commons," was at least as much a debate over equity.

The efficiency "problem of the commons" was presented by Hardin, and is generally presumed, to arise because a scarce resource, belonging to all, is treated by individuals, acting separately and seeking to maximize their own returns, as if it were available without limits and free. As a result there would be excessively and inefficiently intensive of the resource. Even if this was an actual scenario, it would not necessarily imply the destruction of the commons and, "ruin to all," as has sometimes been argued.<sup>7</sup>

The remedy conventionally prescribed for over utilization of common property is "privatization", i.e. conversion of the common resource to private property whose use would then be determined by markets. That was part of the rationale for the enclosure of English commons, that has received so much historical attention. If the markets were perfect, the uses of the converted private property would be perfectly efficient, otherwise not.

The analogy for the global commons might be called "nationalization" - the allocation of shares in global carrying capacity to individual countries. Since the global commons is really a set of characteristic responses to greenhouse gas concentrations, the prior requirement would be an international agreement on the

-----

7 More rigorously, the argument is that the marginal returns from the resource will be driven to zero, because as long as there is some positive marginal return, those with access to the commons will try to appropriate it.

atmospheric gas concentrations that would be tolerated. Nationalization would mean the determination of the accumulated emissions that each country would be allowed to add to the atmosphere, consistently with the overall targets. Once the allocation was made, the individual countries would then make their own decisions as to how and when they would approach their particular limits.

The analogy is not a precise one for several reasons. First, countries are not entities that manage their own resources to maximize profits. Nonetheless, countries assume responsibility for many aspects of their environment, because of its nature as a public good. Presumably they exercise this responsibility in the national interest to maximize their citizen's welfare. To do this, governments, even though they are not profit maximizers, should meet the same general type of rules for efficient resource allocation as private firms, using the tools of social cost-benefit analysis.<sup>8</sup> Secondly, there are discernible boundaries to most kinds of property that can make its allocation quite precise. That is not the case for the global commons, so if it were nationalized, there would have to be monitoring of its use. That, in principle, is not different from the monitoring of the exploitation of oceanic fish and whale populations, which have, in effect, been converted into common properties. The practical

---

8 This statement of efficiency conditions passes over the many difficult incentive and administrative issues that would be involved in their achievement.

in effect, been converted into common properties. The practical problems would, of course, be quite different.

Collective decisions and collective actions are the other alternative to laissez faire and seem to have been more common at the village level, where controls were placed on the use of the commons by individuals. Both the efficiency and equity of collective action depends on the character and effectiveness of the rules that are applied collectively. These, in turn, depend, in part, on the voting procedures that are used.<sup>9</sup>

The proposals for an international agreement to restrict the rate of greenhouse gas emissions, country-by-country, are, in effect, proposals for collective action in the administration of the global commons. This procedure was only approximated in the United Nations Framework Convention on Climate Change. That was partly the result of disagreements as to urgency of the need for any action. Perhaps more important were the differences, which often remained implicit, with respect to the sharing of the burdens of the consequences of any agreement.

#### IV. "Nationalization" vs. collective control of the global commons: logical and practical issues

The choice of approaches should depend on their relative effectiveness in achieving both efficiency and equity. In princi-

---

9 There is a substantial literature on voting procedures, stemming mainly from the seminal work of Kenneth Arrow. The burden of the results is often skeptical. See K.J. Arrow, Social Choices and Individual Values, Cowles Foundation Monograph, No.17, New York, Wiley



ple, the first step in each approach should be a decision on the extent of climate change to be allowed, perhaps none at all. That would determine the acceptable target levels of concentration of greenhouse gases. International equity would depend on how the targets for the net accumulated emissions of each country were determined. The achievement of efficiency and domestic welfare would depend on how each country used its share of the world-wide accumulation target through its annual emissions.

The primary advantage of nationalization is that it would allow each country to determine its own path toward its allocated accumulation level, rather than having that path determined by an international authority. There is a prima facie case that, in general, countries can make better decisions for their own welfare than can international authorities.<sup>10</sup>

It may be argued that the practical difficulties in the nationalization of the global commons are too profound to permit its implementation. They would, certainly, be the most complex set of international negotiations ever attempted. The first logical requirement, the ability to predict the effects on climate of alternative cumulative emissions of greenhouse gases, is not fully within the grasp of atmospheric scientists. In the face of this ignorance, perhaps some maximum target might be set

-----

<sup>10</sup> In opposition to this assertion, it might be argued that countries can be governed by persons who are short-sighted or corrupt and that the creation of a new property right in the global commons only creates another opportunity for mistakes and dishonesty.

provisionally.<sup>11</sup> Next, an international consensus would be required on a tolerable target level of average climate change. That would certainly be difficult to achieve since it would require compromises among nations in different regions which would be affected differently by climate change. Any climate compromise could be expected to involve other types of compromise and, perhaps, economic offsets.

The last step in the negotiations, the distribution among countries of shares in the associated acceptable level of greenhouse gas accumulations would not be less difficult. The distribution could have a major impact on the economic growth of each country.

In the face of the limited knowledge and conflicting goals that would be encountered, shortcuts and logical as well as political compromises are necessary. By comparison, setting targets for rates of emissions of greenhouse gases may be the more straightforward and politically feasible procedure. On the other hand, it is certainly a dangerous tactic to dismiss a more fundamental, though more complex, approach to an international problem. There are many examples of undesirable, even disastrous consequences of foregoing rationality and equity in international as well as domestic policy. The ferment and destruction that

---

11 It should be recognized that there is no special scientific, political or economic status to the doubling of current or 1990 concentration levels, a benchmark often used in making projections.

have resulted from the creation of arbitrary national boundaries provides an obvious and dramatic example. Moreover, even if the attempt is made to confine the debate to acceptable rates of emissions and avoid the issues of allocation of the global commons, it will, finally, not be possible. The national interests of the developing countries will not permit it. The real issues cannot be avoided.

Scientific difficulties in setting atmospheric concentration goals

While the fundamentals of greenhouse warming processes are well known, aspects that are too important to be called, "mere details," remain uncertain. It is impossible to establish empirical relationships because the temporal evidence is too short, and, perhaps, too uncertain to provide a guide. The theoretical relationships are also uncertain. The current global climate models which provide the currently available predictions, at best give long run equilibrium solutions while the path toward that equilibrium is of central importance. At worst, there are scientific criticisms of the models which create misgivings.

There are still unresolved questions as to what happens to the greenhouse gases in the atmosphere, how they interact and even, for example, how long they persist. The roles of the ocean and land masses, in absorbing carbon dioxide and in regulating heat changes, are also not fully understood. There is, moreover, a major discrepancy between estimates of the amounts of carbon

dioxide generated and the amounts that can be accounted for in the atmosphere.<sup>12</sup>

The existence of these scientific uncertainties means that, while the concept of the response characteristics of the atmosphere, the oceans, and characteristics of the earth's soil and biomass may be clear, their measurement is somewhat ambiguous. That, in turn, means that the allocation of quotas in the "global carrying capacity" or the "global commons" cannot be done with the kind of precision that would be desired for policy.

By comparison, it may seem relatively straightforward to make an agreement that would set ceilings on the rates of emissions of the major greenhouse gases. The appearance belies the reality. The essential issue is the radiative forcing of climate, which is determined by the response characteristics of the atmosphere. Thus, the scientific uncertainties that create difficulties in allocating quotas in the global commons also impede the setting of emissions standards.

Difficulties in the economic analysis of the effects of global warming and of restrictions on greenhouse gas emissions

Policies toward social and economic change should be set taking into account all of the resulting gains and losses. The benefits of amelioration of climate change by reducing greenhouse gas emissions should be set against their costs. Yet, there is

-----  
12 See R.T. Watson, et al, "Greenhouse Gases and Aerosols," in J. T. Houghton, G.J. Jenkins and J.J. Ephraums, Climate Change, Cambridge U. Press, N.Y., 1990, pp. 131-1782.

no simple relation between economic activity, greenhouse gas emissions and net contribution to radiative forcing for any single country. There are many potential choices among alternative compositions of output, of fuels and of technologies that generate emissions. While there has been progress in the analysis of the economic costs of restricting carbon dioxide emissions, the analyses are far from definitive. There has, in addition, been only one attempt to extend the analysis to other greenhouse gases and that includes only methane.

Even by comparison, relatively little has been learned about the costs of climate change - which would be the benefits of avoiding such change. There have been some overall attempts at quantification, but these are, frankly, speculative and the more solidly grounded work is quite limited in scope.

Finally, there are great differences among countries in natural resources, capital stocks, education levels, technologies and standards of living. Thus, there is no reason to expect that the relations between economic activity and greenhouse gas emissions are the same for every country. Each country, if given a quota of the global carrying capacity, could be expected to make somewhat different choices of its own rate of usage or annual emissions rate.

Suppose that, instead of controlling emissions rates, each country were given a quota of total accumulated emissions as a share of the worldwide allowable emissions. Then, the less developed countries of the world, relatively impoverished and with

relatively large unutilized quotas might well decide to increase their rate of use of their allocated global carrying capacity and their emissions rates for a long time. There might also be sales or leases of emissions "rights" among countries. Developing countries can be expected to have some unused quota which they could sell or lease. Industrialized countries wanting to avoid drastic adjustments brought on by sharp reductions in emissions would be on the buying or renting side. The terms on which the emissions rights exchange would depend on the type of emission and on the demand and supply conditions that generated the emissions. For example, methane's atmospheric lifetime has been estimated at 10 years and carbon dioxide's at 50 to 200 years.<sup>13</sup> An industrialized country using a relatively large amount of natural gas, whose production and use releases methane into the atmosphere, might want to make a deal for a quota for methane emissions. A country more dependent on coal and petroleum might propose deals on carbon monoxide emissions.

There have been attempts to define Global Warming Potential as a relatively simple physical concept that could be the basis for trade in emissions rights. This is bound to fail as there can be no solely physical index of the economic consequences of greenhouse gas emissions. When emissions of a particular gas become binding constraints, the economic opportunity costs imposed

---

13 R.T. Watson, op.cit., p.7.

by the constraints will, in general, be different from period to period as well as different from country to country.<sup>14</sup>

There are studies that claim a great deal can be achieved by improvements in efficiency in the use of fuels, with the net result of fewer emissions and improved economic performance.<sup>15</sup> There are also studies that conclude that, with only modest technological improvements, the costs of adjustment to lower emissions will be relatively small, for the U.S. and, presumably, for other, generally similar industrialized countries.<sup>16</sup> On the other hand, there are results that indicate the welfare costs of adjustment to much lower emissions rates will be quite large, at least for developing countries.<sup>17</sup> These latter results are plausible because adjustment is more difficult in developing countries than in the industrialized countries. So the imposition of an additional constraint, in the form of emissions restrictions, may well have a more severe impact.

-----  
 14 See, for example, Daniel A. Lashof and Dilip R. Ahuja, "Relative contributions of greenhouse gas emissions to global warming," Nature, 344, 5 April, 1990, pp. 529-531 and R.S. Eckaus, "Comparing The Effects of Greenhouse Gas Emissions on Global Warming," The Energy Journal, 13(1), 25-35.

15 See Committee on Science, Engineering and Public Policy, National Academy of Sciences, et al, Policy Implications of Greenhouse Warming, National Academy Press, Washington, D.C., 1991, Chap. 6.

16 Jorgenson, Dale and Wilcoxon, "Environmental Regulation and U.S. Economic Growth," presented at the MIT Workshop on Energy and Environmental Modeling, July 31-Aug.1,1989.

17 Blitzer, Charles R., Eckaus, Richard S., Lahiri, Supriya and Meeraus, Alex, "A General Equilibrium Analysis of the Effects of Carbon Emission Restrictions on Economic Growth in A Developing Country," Center for Energy Policy Research, MIT, January, 1990

It might be argued that all the differences among countries that would lead to differences in preferred emissions rates could be taken into account, even if the international negotiations were confined to reducing greenhouse gas emissions. To do that in a carefully discriminating manner, however, the negotiators would, themselves, have to do what the individual countries would do if given their share of the global carrying capacity. That is, they would have to work out the intricate relationships between the economic conditions and growth prospects for each country and rates of greenhouse gas emissions. There is no escape from those linkages.

Political difficulties in setting atmospheric concentration goals

It is a superficial and incorrect argument that, because the problem of global warming is global, there are common interests in controlling it. Because of the regional differences in its effects and of differences among countries in the impact of emissions constraints, there will be differences in the interest of countries in moderating global warming. The histories, the current conditions and the prospective futures of each country involved in the negotiations are quite different and the differences are relevant to their negotiating positions. Some countries are poor now and some are rich and that affects their relative current and desired future rates of use of the global commons.

A point that has already been made forcefully by representatives of developing countries is that most of the greenhouse gases in the atmosphere with anthropogenic sources have been



pumped there by the industrialized countries in the course of their own development. These countries, it is argued, therefore have a greater responsibility to constrain their emissions. An implication of this type of argument is that there are quotas for greenhouse gas emissions and that the industrialized countries have already used a substantial part of their allocation.

The interests of the developing countries of the world will continue to impel them to pose these arguments, directly or indirectly, obscurely or unequivocally, as to the relative rights of the industrialized and developing countries to discharge greenhouse gases into the atmosphere, i.e., the allocation of rights to the global carrying capacity. Thus a focus on rates of emissions will not permit an escape from the essential problem of setting an overall greenhouse gas accumulation target and distributing shares among countries.

#### Viability of international agreements to constrain emissions

Suppose an international agreement were signed committing each country to limit its greenhouse gas emissions. That, itself, would not guarantee compliance, largely because, in the absence of some form of coercion, the gains and losses from compliance and noncompliance are as quite unequal. Small emitters, rich or poor, may believe that they can have any benefits of general emissions constraints without actually constraining their own emissions. For small emitters, violation of an international agreement to limit emissions will hardly affect the final outcome in terms of the accumulation of greenhouse gas emissions. This

expected behavior is a version of the "free rider" problem, well-known in economics.

For poor countries, whether large or small, the benefits of violation of an international agreement restraining emissions, in terms of increased growth, may well be regarded as outweighing the longer term harm in larger contributions to radiative forcing. For countries that are both large and poor, violations may lead to discernible differences in greenhouse gas accumulations.<sup>18</sup>

With these expectations of noncompliance, monitoring and coercion will be necessary to enforce any agreements. Robert Wade in his discussion of the skepticism of Mancur Olson on collective action to manage common assets<sup>19</sup> comments on this point:

Where Olson and other pessimists about collective action are surely right is in the need for coercion to back up agreements. Their emphasis on the difficulties of voluntary collective action is a useful counter to the simple optimism of those who

---

18 There are various simple games that can be constructed to illustrate the point in which rich and poor and large and small countries "play" against each other. It is important to note in constructing these games that the greenhouse gas emissions of large and small countries and rich and poor countries will be of quite different magnitudes and, or, have different payoffs. They, will, therefore, have different consequences for possible eventual greenhouse warming.

19 M. Olson, The Logic of Collective Action, Harvard U. Press, Cambridge, Ma., 1971.

believe that community development projects, people's participation, water users' associations, and the like are mainly a matter of teaching people about their real common interests or promoting values that are less individualistic.<sup>20</sup>

This can expected to be true on an international scale as well.

Monitoring, of the major sources of emissions, would not be as difficult a task as, say, monitoring of nuclear missiles, for nearly every significant source must be out in the open. Nonetheless a large scale effort would be required. Domestic production and international trade statistics will provide essential information on country fuel balances, which will indicate sources of greenhouse gas emissions. There may have to be on-site inspections or, possibly, inspection by orbiting satellites and a cadre of analysts counting acres of paddy and thermal electric stations.

Because of the differences in the scale of emissions of large and small countries, it might be argued that monitoring and enforcement should be limited to only the few large countries whose policies would have a discernible impact. On the other hand, for the purposes of international equity and domestic public support, the large countries will want to reduce the prevalence of "free riding" on the part of smaller countries.

---

20 op.cit., p. 229.

For the purposes of coercion, there are a number of instruments, most important of which might be access to international trade and finance. Invocation of coercive instruments would certainly require prior international monitoring.

What could be done about countries that become "bankrupt" with respect to their greenhouse gas emissions quota. First of all, "bankruptcy" would have to be identified by monitoring and comparison with the country's program of intended emissions. If it were identified, procedures could be used that are analogous to the treatment of countries that cannot meet their international financial obligations. That is, the country would be constrained to follow an agreed upon plan to reduce their emissions rates to come into conformance. To enforce these restrictions the international community would have to have agreed beforehand on the kinds of coercion that it would bring to bear, if necessary.

#### IV. How should the rights to the global commons be allocated?

There are two aspects to this issue: how can the shares in the global commons be allocated and how should prior omissions be debited against these shares. These are thorny issues, but even if they are sidestepped and left implicit, rather than faced openly, after the fact, there will inevitably be an analysis to determine what the tacit agreement was.

The following represent some of the major possibilities, and, in practice, they might be combined:

- (1) allocation of future quotas on a per capita

- basis, with debits for past emissions,
- (2) allocation of future quotas on a per capita basis, with the rule for past emissions that "bygones are bygones",
  - (3) allocation of future quotas with adjustments so that they vary inversely in relation to per capita income,
  - (4) allocation of future quotas with adjustments so that they vary inversely with deviations from a specified "poverty level" of per capita income,
  - (5) allocation of future quotas with the rule that no country's per capita income level should be reduced as a consequence.

The first alternative, is, perhaps, the most instantly appealing but would face significant objections. If accepted, the resulting distribution would become a limiting constraint on the economies of the developed countries most quickly. As a result it could be expected that they would put forward all kinds of opposing arguments, some of which would not be entirely self-serving.

The richer countries might assert that they should not be penalized by the fact that, due to the process of growth, itself, or, as a result of their culture and mores, they had limited their population growth rates, while the poorer countries had not. They might also argue that their advancement has and will contribute indirectly and directly to the advancement of the poorer countries. There are senses in which that is true, but,

on second thought, considering the reactions that might be provoked from previous colonies, perhaps the more judicious decision would be to avoid the proposition. Some might also argue that future generations should be considered in any distribution of commons. It is, after all, not so difficult to make reasonably good population projections. The argument would certainly be opposed on the grounds that it encouraged population growth.

The developed countries may also contend that, "bygones are bygones," since those emissions occurred in innocence of what their potential climatological effects might be. and, thus, that every country should stand on an equal basis (somehow defined) in the approaching international negotiations. Yet the developed countries are benefiting from the actions of the past that have, in effect, appropriated part of the atmospheric carrying capacity. In this relevant sense, bygones are not bygones.

The allocation of quotas in inverse proportion to achieved per capital income levels would be a rough way of recognizing the differential contributions of the various countries to the existing stocks of greenhouse gases with anthropogenic origins. If the allocations were made in proportion to deviations from some poverty level, that would mitigate the effects on the industrialized countries.

The last of the rules would be a kind of compromise position that would also contain incentives for the industrialized countries to reduce their emissions rates in relation to their achieved levels of income and output.

Economists, like other specialists, resort to what they know about and it comes to mind to ask whether there are any Pareto optimal allocations, i.e., allocations that will make at least one country better off, without making any worse off. It must be the case that some decision on an allocation is better than none at all, which could result in global warming for all. A theorem enunciated by Prof. Ronald Coase of Chicago University, may appear to address the present issue.<sup>21</sup> The theorem says that, even where there are externalities, economic efficiency can be achieved by assigning "rights" to the externality, whatever the distribution of the rights. That is the argument for nationalization or collective control, rather than anarchy, in the use of the global commons. Beyond this point, the theorem lacks relevance for two reasons. First, it does not address issues of equity and there would certainly be distributional consequences among countries of different distributions of emissions quotas. That is, each possible distribution will have implications for each country's achievable levels of output and income. Perhaps those can be submerged in a general euphoria about "doing something", but it is doubtful.

Second, the theorem requires the existence of perfect, or anyway pretty good markets. If markets, including international markets for goods and finance, were perfect, there would be different patterns of development than we now observe.

---

21 R.H. Coase, "The Problem of Social Cost," Journal of Law and Economics, 3, 1-44.

There will be no easy answers or answers based on universally accepted principles to the quota allocation problems. The outcome will have to be some kind of political compromise. It will be difficult, if not impossible, to gain general international acceptance for any rule that appears to value people in different countries differently. That implies some version of the first rule of allocation by population, with debits for previous accountable emissions.

Any amendments to this rule would have to meet a "fairness" test. One such amendment would base the allocation on populations in some post World War II year, say, 1950 would meet some of the issues raised in the other rules on the list. It would recognize that most of the developing countries became responsible for their own economies only after achieving independence from colonial rule and that, for all of them, their "big push" toward development came after World War II. However, it would also contain an implicit penalty for high population growth rates since 1950. The choice of a year at which to begin counting cumulative emissions to debit against the original allocations would provide also provide scope for compromise.

### VII. Conclusions

There are grand issues at stake, with scientific, economic and political questions closely intertwined. International negotiations can be successful only if they contribute to a better understanding of these issues and address the fundamental issues. Fortunately, the negotiations are not a zero sum game. If the



global warming phenomenon is real, all countries will stand to gain from arriving at an agreement, although to different degrees. As in other negotiations of this sort, the final agreement will be a compromise with variability in the extent of the gains.

Where internal politics is not compelling, it can be expected that some countries will opt to delay agreements until the gains and losses can be determined with more accuracy than is now possible. This, apparently, has been the U.S. position. With modest and specialized exceptions, the Green movements in the developing countries have little political influence, as compared to the European countries, in particular. That will make it easier for them, also, to delay agreement. In such circumstances, they will have to be "bought out" or threatened by the industrialized countries that want to restrict emissions.

The role of developing countries will be crucial. Their interests go in the direction of rational decision making, which is to make the allocation of shares the center of attention. They can also argue their case on economic efficiency grounds. Arbitrary levels of emissions restrictions will create more economic damage than allowing countries free choice in their intertemporal distribution of their emissions.