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Toward A Political Analysis Of The Consequences Of A World Climate Change Produced By Increasing Atmospheric Carbon Dioxide

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by

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DISCLAIMER

It was Hegel's extraordinarily deep and perceptive insight that mankind is caught up in a drama that cannot be fully understood until it has been played out. "The owl of Minewa spreads its wings only with the falling of the dusk." On the more hopeful side is the fact that, although we cannot know (without some strange "time-warp") the consequences of future interactions between climate and society, we can begin to work toward political solutions and gird ourselves for ominous trends that are now coming into view. The purpose of this paper is to identify one such trend, namely the increase of atmospheric temperatures due to increased carbon dioxide (CO_2) and lay some initial groundwork for political research related to climate -societal interactions.

I. Introduction

An assessment of climate-societal interactions is an incredibly complex undertaking. One must be at once a meteorologist, an oceanographer, a glaciologist, an economist, a social psychologist, an agronomist, as well as a political scientist to understand the complete climate-society picture.

Prior to the climatic anomalies which triggered severe socio-economic consequences in 1972, including the collapse of the Peruvian anchovy harvest (Glantz, 1979), and the Canadian tobacco crop (Hare, 1979), terrible droughts in the Soviet Union, India, and China (White, 1978), along with the fourth consecutive year of drought in the Sahelian countries of West Africa, few foresaw the intimate connections between climate and society. Indeed, too many persons continue to "blame" climatic perturbations instead of societal conditions which determine the magnitude

of socioeconomic impact. As one meteorologist has put it: "Natural disasters are not physical phenomena. They are a social phenomenon induced by physical events" (Garcia, 1980).

Recently the World Meteorological Organization convened the World Climate Conference in Geneva to investigate the relationship between climate and socioeconomic activities including the impact of increased atmospheric CO_2 upon the global climatic system. A declaration (WMO, 1979) drawn up by the participants concluded in part:

> The global climate has varied slowly over past millenia, centuries and decades and will vary in the future. Mankind takes advantage of favourable climate, but is also vulnerable to changes and variations of climate and to the occurrence of extreme events such as droughts and floods. Food, water, energy, shelter, and health are all aspects of human life that depend critically on climate. Recent grain harvest failures and the serious decline in some fisheries emphasize this vulnerability. Even normal variations and modest changes relative to the normal climate have a significant influence upon man's activities.
>
> All countries are vulnerable to climatic variations, and developing countries, especially those in arid, semi-arid, or high rainfall regions, are particularly so. On the other hand, unfavourable impacts may be mitigated and positive benefits may be gained from use of available climate knowledge.
>
> The climates of the countries of the world are interdependent. For this reason, and in view of the increasing demand for resources by the growing world population that strives for improved living conditions, there is an urgent need for the development of a common global strategy for a greater understanding and a rational use of climate.
>
> Man today inadvertently modifies climate on a local scale and to a limited extent on a regional scale. There is serious concern that the continued expansion of man's activities on earth may cause significant extended regional and even global changes of climate. This possibility adds further urgency to the need for global cooperation to explore the possible future course of global climate and to take this new understanding into account in planning for the future development of human society.

One of the most disquieting developments in the climate-society interaction is the unanticipated concentration of atmospheric CO_2 as a result of our ever increasing use of coal, petroleum, and natural gas (fossil fuels) (Bacastow and Keeling, 1973) and deforestation of tropical woodlands (Adams et al., 1977; Bolin, 1977). The annual rate of fossil fuel use has been a fairly constant 4.3 percent during the 20th century. Woodwell et al. (1978) estimate that the biospheric injection of CO_2 into the atmosphere is comparable to that of fossil fuel combustion. The annual CO_2 injection as a result of man's activities is estimated at 10-13 x 10^{15}g of carbon although only 55 percent of this remains "airborne" (Bolin, 1970, Woodwell, 1978; Kellogg, 1980). The remainder is taken up by other storage areas or so-called "sinks", largely by oceans (chiefly the top 300 feet) and also by biospheric reservoirs, i.e., forests and soil humus (Zimen, 1978). Recent investigations, however, show that the latter has been decreasing as a CO_2 sink due to deforestation and agricultural practices (Stuiver, 1978).

There is a very real prospect that a doubling of the atmospheric CO_2 concentration may occur by about 2030 AD and that a global surface temperature change of about 1°C (5°C at the poles) may occur some time around 2000 AD, in the absence of dramatic shifts in the world's present energy sources and deforestation policies (Manabe and Wetherald, 1975). A rather rough but "best estimate" picture of the future climate assuming we continue on our present course of "modernization" is illustrated in the following figure.

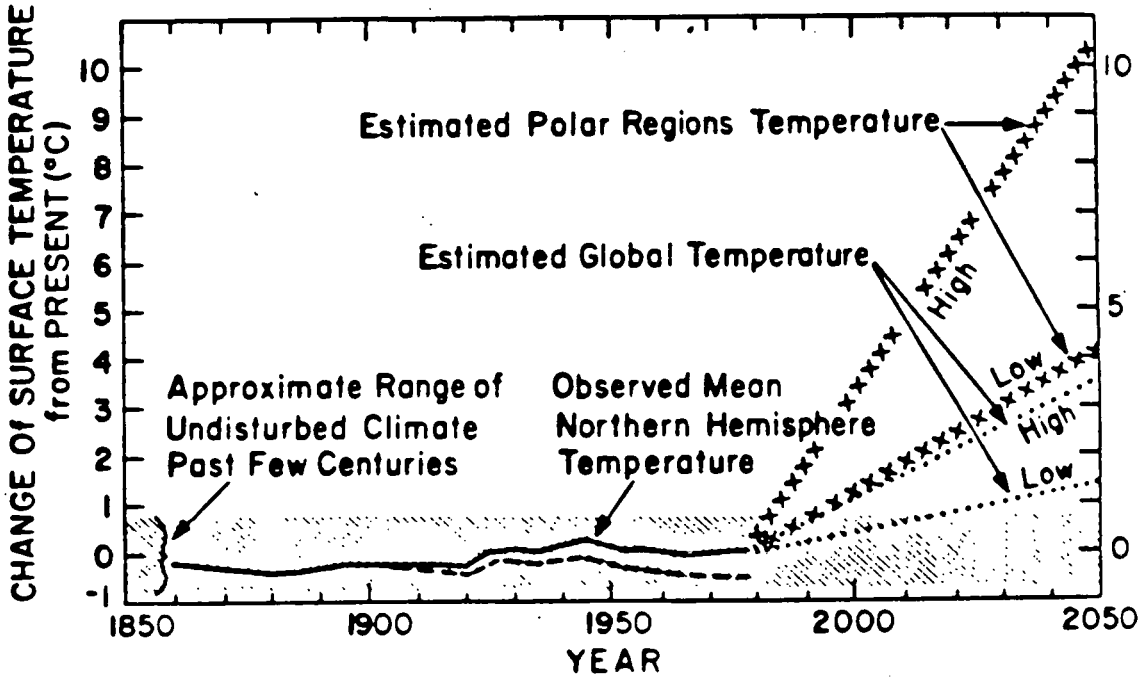


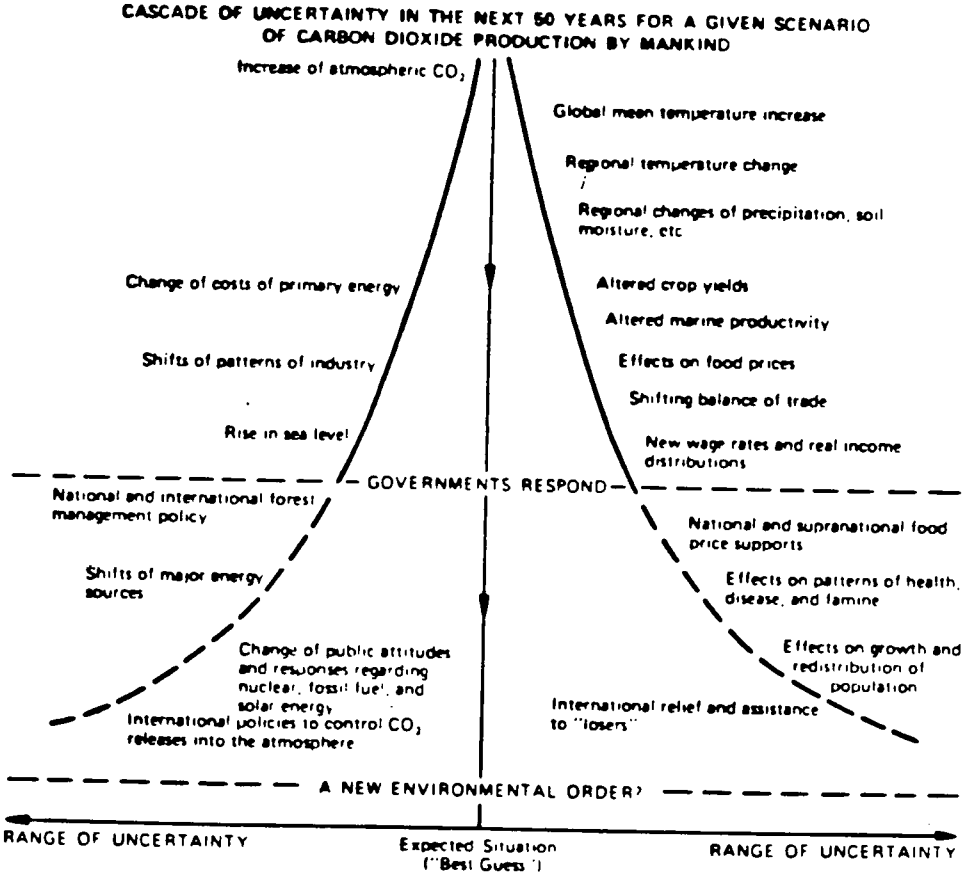
Figure 1. Estimates of past and future changes of surface temperature to be expected for each of the two assumptions about rate of increase of fossil fuel consumption and carbon dioxide production. The shaded region is the approximate range of mean surface temperature during the past 1000 years or more. The dashed line indicates the past temperature changes that might have occurred if there had been no carbon dioxide increase. (Kellogg, 1979)

II. So What If the Atmosphere Warms Up?

The geophysical effects of increasing atmospheric carbon dioxide are by now well known: namely, CO_2 allows visible sunlight to pass through thereby heating the surface and biosphere, but absorbs outgoing terrestrial infrared radiation. This results in the so-called global "greenhouse effect". Assessments of the potential consequences of a CO_2-induced atmospheric warming on political decision-making, economic activities, and individual perceptions has received far less attention than the

purely physical investigations of the climate system. This is due, in part, to the cascade of uncertainties inherent to the "CO_2 problem". The relatively certain and uncertain components of this problem -- all potential areas for further research -- are illustrated in Figure 2.

Figure 2.



Despite the large uncertainties associated with a hypothetical CO_2-induced global warming there are certain social and environmental "catastrophes" which need to be assessed now, however fragmentary our forehand knowledge of them may be.

One of the most ominous events on the CO_2 front concerns the environmental, socioeconomic, and legal implications of coastal submergence as a result of the possibility of a disintegration into the surrounding ocean of the huge and presently unstable West Antarctic Ice Sheet. This mass of ice sits on bedrock below sea level, and a warmer ocean could melt its foundations, releasing its present grip on the continent. If this happened sea level could rise some 5 to 7 meters (15 to 20 feet) but there is a great deal of argument as to the timing and geographical distribution of such an event (Hollin, 1972; Hughes, 1975; Clark and Lingle, 1977, Mercer, 1978).

In 1950, 27.6 percent of the world's population was located within a 50-km area adjoining oceans and seas. This included 23 percent of the population in large cities (Pokshishevsky, 1976). The effects of what the Venetians know so well as "acqua alta" - high water - on land surface drainage, erosion, population, income and wealth distributions, and damage costs has received remarkably little attention. Less than a handful of studies are available on the demographic and economic impacts of a CO_2-induced rise in sea level (Schneider and Chen, 1979; Kellogg, 1979). One combined geographic-demographic analysis (Schneider and Chen, 1979) of a sea level rise in the United States estimates that:

> ...as much as one-fourth of Florida may be submerged by a 4.6 m local rise and one-third by a 7.6 m rise, including all but four of its cities of over 25,000 people (in 1970) in the latter case. Louisiana would be subject to inundation of comparable magnitude. New Orleans, Louisiana, is of particular note since much of the city is already several feet below sea level, protected only by extensive levees. Large portions of the Texas coast, including the cities of Galveston,

> Corpus Christi, Beaumont and Port Arthur, already very susceptible to hurricane flooding because of the flat terrain, would be inundated permanently. In the mid-Atlantic region, a 25-foot rise would submerge Savannah, Georgia; Charleston, South Carolina; four out of the eight Virginia cities with populations over 100,000 (in 1970); one-fourth of Delaware; and portions of Washington, D.C., including much of the Smithsonian Institution. One could launch a boat from the west steps of the United States Capitol, should such a flooding occur, and row to the White House South Lawn. Along the north Atlantic Coast, although only small land areas are involved compared with the previous regions, well-developed coastal lowlands in several major cities such as New York City, New York; Atlantic City, New Jersey; and Boston, Massachusetts (including most of the Massachusetts Institute of Technology and Harvard University) would be inundated by a 15 to 25 foot rise in local mean sea level.

Other, perhaps equally important potential impacts triggered by a CO_2-induced climatic change should not be ignored. In this connection it is important to emphasize that the new patterns of temperature and precipitation will be quite different from the present, some becoming better for crop yields, some worse. Other likely consequences, including fluctuations in pest populations, shift of fisheries, and human population relocations, must be considered in anticipation of marked changes in the temperature of the earth's atmosphere (NAS, 1977; Kellogg and Schware, 1980; Takahaski and Yoshino, 1978; NDU, 1978; Kellogg, 1977).

III. Political Responses

The important political aspects of the CO_2 problem can be identified by examining three central questions: (1) What types of decision-making responses are likely? (2) Can responsibility for damages induced by CO_2 production and the consequent climatic change be assessed? (3) Are there international mechanisms to deal with this essentially global problem?

1. Decision-making responses

1.1 No response. Given the uncertainties in long-range, future-

oriented international planning, including uncertainties as to intentions of future decision-makers, uncertainties as to alterations in economic and political structures, uncertainties regarding overall control of specific programs, and the strategic uncertainty of possible institutional and value changes, there is the possibility that at the international level very limited action (if any) will be taken in response to the CO_2 problem in the next few decades.

The outcome of a "no response" decision by national leaders and the international community as a whole is extremely difficult to predict. The "no response" strategy really calls attention to a strictly political possibility in a political context. Should decision-makers decide not to plan for or monitor the impacts of increased atmospheric CO_2 production, nor provide ways to ameliorate hardships or capitalize on benefits likely to accrue and communicate these actions to the public, it can be anticipated that other forms of action will be taken. Market adaptations to shifts in supply and demand, the incidence of disease, a succession of good or bad harvests, will all have consequences with uncertain probabilities. One cannot assume therefore that the "no response" strategy will result in "no action".

Moreover, in societies where there is a critical awareness of possible environmental hazards and where the government disregards the situation, unpredictable actions are often taken either by special interest groups or at local government-

al levels. Public clamor for legislative and administrative response to changing environmental conditions can bring about state and federal actions to provide new social programs and alternative energy strategies. Such actions do not, therefore, always come "from the top down" and may in fact have built-in citizen participation roles depending on the relative importance of the problems at hand.

1.2 Incrementalism. There is a certain approach toward the CO_2 problem which may enjoy strong support so far as policy-making is concerned. It may be easier to "muddle through" problems that arise because of a warming due to atmospheric carbon dioxide, i.e., to tackle problems on a case-by-case (crisis-by-crisis) basis, rather than attempt bold large-scale and long-term social experiments that must involve the entire international community in order to be effective.

The incremental approach may be described as follows: Because the practical socioeconomic consequences of a global CO_2 warming are hard to comprehensively calculate and plan for owing to our limited knowledge and to the divided character of our sociopolitical institutions (it will be argued), fundamental large-scale experiments must be avoided for the time being. As the climatic change occurs there will most likely be some possibility of applying piecemeal adjustments developed through trial and error. One social institution can be altered at a time. In this way small and gradual responses can be made.

Furthermore, many people will maintain that as the incre-

mental approach allows continuous readjustments, we shall be in a position to learn from our mistakes without risking political controversies, inconveniences, and the heavy costs involved in any major reconstruction of the structure, objectives, and techniques of agriculture, industry, and water resource programs. By sub-optimizing, i.e., achieving goals only partially, choosing alternative policies which differ only marginally from the status quo, saving time by settling for limited policies which win political consensus, and confining social experiments to an economic sector or to a region, very sweeping changes and unpredictable consequences are seemingly avoided.

However, restricting attention through the incremental approach to lower-level and less complicated adjustments has its imperfections. Lindbloom (1959) has argued that while the process of "muddling through" is an accepted method of decision-making, undoubtedly superior to trying to act on comprehensive blueprints that are unrealizable, it is severely limited in that:

1. Important possible long-term outcomes are neglected.
2. Important alternative policies are neglected.
3. Important affected values are neglected.

These, however, are the "costs" of fairly concrete, temporary measures realized not at some far away time but during

the lifetime of the present generation. In a certain sense, it discounts the distant future, the future of children and grandchildren, and emphasizes the interests of the present.

2. Fairness Issues

Different conceptions of "fairness", based on philosophical, legal, and economic principles will doubtless influence the behavior of governments with respect to developing alternative strategies and in dealing with the impacts of a CO_2-induced global warming. Examples of some of the more general ethical considerations are mentioned below.

2.1 The right to a "clean" atmosphere

This concept is justified on the grounds that the atmosphere is without clearly defined or enforceable ownership rights - an unappropriable good - and should therefore be managed collectively for the common benefit of all countries and individuals, as well as by the fact that the atmosphere was initially "free" from an excessive burden of CO_2. The acquisition of a right to emit CO_2 into the atmosphere thereby triggering potential climatic and socioeconomic impacts has never been negotiated between countries. Nevertheless, we already have a body of international law and some relevant international principles which may make "harmful" CO_2 emissions unlauful under international law.

The year 1972 was a memorable one in the development of international environmental law due to the United Nations Conference on the Human Environment held in Stockholm. The declaration and recommendations for action adopted by this conference

were a first step toward legal and political accountability in global environmental matters. Principle 21 of the Declaration makes States responsible: "...to ensure that activities within their jurisdiction or control do not cause damage to the environment of other States or of areas beyond the limits of national jurisdiction." Principle 22 provides that: "States shall cooperate to develop further the international law regarding liability and compensation for the victims of pollution and other environmental damage caused by activities within the jurisdiction or control of said States to areas beyond that jurisdiction."

The 1971 United Nations resolutions on Development and Environment also dealt with the question of the right of all peoples to a "clean" environment, as did the much earlier and more limited OECD Convention (Article 2, 1960) which states that:

> "...the members agree that they will, both individually and jointly ... pursue policies designed ... to avoid developments which might endanger their economies or those of other countries."

There are, to be sure, formidable problems in the practical application of such international principles, especially inasmuch as common emission standards, environmental quality standards, or even procedures whereby such standards could be fixed, have not been established. Indeed, to a large extent these international principles merely serve as the expression of guiding ideals of member countries.

2.2 The "Polluter" Pays Principle

Following from the conclusion that the importance of national borders should be reduced so far as many environmental matters (especially "common-property resources") are concerned, the Council of the Organization for Economic Cooperation and Development (OECD) adopted the Polluter Pays Principle (PPP) to deal with transfrontier pollution. Most OECD member countries have included the PPP in their own domestic legislation. As recommended by the OECD Council (1972) the PPP is:

> to be used for allocating costs of pollution prevention and control measures to encourage rational use of scarce environmental resources and to avoid distortions in international trade and investment ... This principle means that the polluter should bear the expenses of carrying out the above-mentioned measures decided by public authorities to ensure that the environment is in an acceptable state. In other words, the cost of these measures should be reflected in the cost of of goods and services which cause pollution in production and/or consumption.

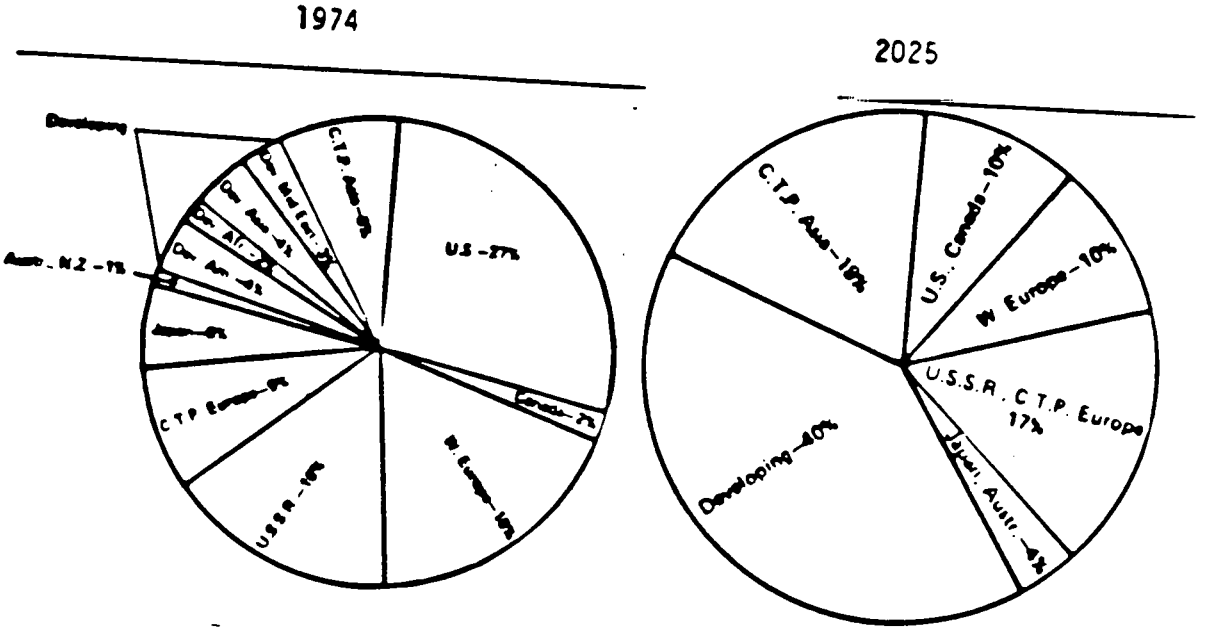
Underlying the PPP is the assumption that since little is known of the exact social costs imposed on the international community by an environmental problem, say pollution, it is more feasible to require control costs be paid by discharging countries than to "punish" polluters by imposing environmental damages. Assigning partial liability, i.e., control costs and not residual damages, to discharging countries is not without limitations as a principle of equity as well as an economic efficiency principle (Ruff, 1976; d'Arge, 1976; Barde, 1976).

2.3 Limited Responsibility

Rather than approach the CO_2 problem from a "global" or "cost-sharing" or "collective responsibility" perspective, one might choose a more exclusive concept on the basis of the income distribution of the countries concerned. This approach might be that the developed countries should bear the main brunt of CO_2-control costs, mitigation strategies, and socio-economic impacts, either because they are principally responsible for the high concentrations of atmospheric CO_2; or because developing countries cannot be expected to devote as high a proportion of their scarce resources to controlling CO_2 production as the wealthier developed countries; or because what is known of the probable CO_2-induced climatic changes indicates that the privileged position developed countries (especially in the United States and Western Europe) now have in agricultural production is likely to be lost.

This approach may indeed be a "fair" general objective in allocating CO_2-control costs now. It should be noted, however, that the rationale of assigning responsibility on the share of CO_2 production may in the future shift that responsibility from the developed to the developing countries, as Figure 3 illustrates.

Figure 3. Global CO_2 production by world segments (Rotty, 1977)



3. International Legal Mechanisms

So far as some kind of legal resolution of injuries or damages caused to individuals and to countries from CO_2-induced atmospheric warming is concerned, we should not expect of international law either too little or too much. Persons who have little faith in the international legal system point to the fact that countries ultimately remain free to comply or to ignore international instruments as they see fit. Indeed at present there is no international mechanism whose task would be to set CO_2 standards, establish universally applied control measures, and enforce the so-called "global right" to a clean atmosphere.

That there is nowhere in the international arena anything like a real "policing" body to control CO_2 production on a global scale - thereby presenting ominous alterations in the existing environmental regime - is presently less serious than if there were no inter-

national mechanisms available to: a) examine the likely effects of a CO_2-induced warming on socioeconomic activities; b) determine what constitutes an "unreasonable" use of natural resources which when burned emit vast amounts of CO_2 into the atmosphere; and c) recommend to governments, as far as practicable, measures to prevent and deter activities which enhance the atmospheric burden of CO_2.

Liability claims, sanctions, and indemnity awards are rather awkward means for resolving any transnational burdens likely to result from a CO_2-induced warming trend, including possible distortions in trade, environmental damages, population relocations, etc. More importantly, by the time such forms of redress are brought before, settled, and (if possible) enforced by future international legal mechanisms, the perhaps irreversible socioeconomic impacts will have already occurred - a situation that we hope could be avoided by the establishment of appropriate remedies and the building of effective institutional arrangements for managing the atmosphere. We assume here of course that the most appealing course of action is to avert such CO_2-triggered socioeconomic impacts before we must attempt to settle serious international disputes and damages. In this subsection some mechanisms of international law are discussed which may, within the coming few decades, become especially applicable to CO_2-related issues.

3.1 Intergovernmental agencies.

Specialized international agencies have assumed a primary concern for investigating the causes of warmer atmospheric conditions and the important role which mankind plays in the likely problems associated with CO_2-induced environmental abuse. Several United Nations' agencies, such as the World Meteorological Organization (WMO), the United Nations Environmental Program (UNEP), the World Health Organization (WHO), and the Food and Agriculture Organization (FAO), have been concerned with assessing transnational environmental problems and putting the "CO_2 question" in a proper and global perspective.

We can see more and more evidence of an international demand for, and a national government response to, the application of climate knowledge in planning both socioeconomic and environmental activities in the very recent establishment by the WMO of the Climate Data (CDP) and the Climate Applications (CAP) Programs. These are official subprograms under the World Climate Program (WCP). The Climate Impacts Study Program (CIP), established at the same time under the WCP, and with UNEP assuming primary responsibility for it, deals extensively with assessing and forecasting environmental and socioeconomic effects of climatic changes. Its programs are designed to aid decision-makers in preliminary assessments of the various risks and benefits of alternative policies in such areas as energy, agri-

culture and water resources.

3.2 Agreements

The actual breadth and character of international legal agreements may vary greatly. It should be noted that although there exist a wide range of potential bilateral and regional agreements on the significant risks of harm, injury, and damage resulting from increasing CO_2 emissions, no steps have thus far been taken to utilize such agreements and other regulatory machinery for CO_2-related problems. Various treaties and regional organizations offer examples of this particular approach, however. The treaty on the River Plate Basin, for instance, was signed in 1969 by Argentina, Bolivia, Brazil, Paraguay, and Uruguay to promote the "harmonious and equitable development" of the natural resources in the Basin area, to utilize the water resources in a "reasonable" manner, and to ensure the "preservation for future generations" of the water, vegetable, and animal resources (Nanda, 1975).

There has been an increasing trend since the end of World War II for the negotiation of types of treaties and conventions which apply general principles of international law to such transnational environmental public health and safety problems as marine pollution, nuclear weapon tests, and the use of outer space. Nations engaging in these agreements have undertaken at least the preliminary steps toward clarifying the mechanisms and procedures through which regulation, control, and enforcement policies can be implemented. This also

applies to the growing acceptance by nations of regional organizations such as the European Economic Community (EEC), and the Organization for Economic Cooperation and Development (OECD), set up to deal with specific supranational problems through broader compacts. Although transnational problems are probably a long way from solution, the valuable function these mechanisms provide is in setting forth cooperative plans of action and international commitments to settle disputes and ensure international environmental quality.

3.3 International Commissions

The findings and recommendations of international commissions, ranging in form from Conciliation Commissions to Arbitral Tribunals to Commissions of Inquiry are not without significance for international behavior. The applicability of such commissions, so far as the CO_2 problem is concerned, is likely as a useful ad hoc device to either arbitrate disputes or to establish the opinion of experts on controversial legal, political and scientific issues with a view to future settlement. A particularly significant utilization of a Commission for the purposes of investigating atmospheric pollution, of recommending control measures, and then for supervising compliance with the provisions was the International Joint Commission (IJC) set up by the United States and Canada (Welsh, 1968).

3.4 International Conferences

At present, convening an international conference on the effects of increasing CO_2 production may perhaps be the most

practical form of international legal activity. Conducting international relations through special conferences is, to be sure, becoming an accepted practice among countries. The United Nations has exerted a real impetus in this direction, convening as it has such important conferences as the United Nations Conference on the Law of the Sea (UNCLS) and the United Nations Conference on the Law of Treaties.

The value of recommendations put forth by international conferences is that they tend to clarify general principles by calling attention to matters which should be dealt with within the domestic jurisdiction of the member States. Recommendation 70 of the Stockholm Conference (1972), for instance, states:

> ...that Governments be mindful of activities in which there is an appreciable risk of effects on climate, and to this end: a) Carefully evaluate the likelihood and magnitude of climatic effects and disseminate their findings to the maximum extent feasible before embarking on such activities; b) Consult fully other interested States when activities carrying a risk of such effects are being contemplated or implemented.

It should be borne in mind that we have dealt with only a few of the possible international legal mechanisms for handling the socioeconomic consequences of a global CO_2-induced climatic change. Special mention should be made of diplomatic negotiations, the Permanent Court of Arbitration, and the International Court of Justice (Wilson, 1973; Weiss, 1978) inasmuch as each of these institutional arrangements and procedures may be

utilized to resolve possible CO_2-related compensation disputes and financial and technical assistance controversies.

IV. CONCLUSIONS

By burning fossil fuels and probably by deforestation and mismanaged land-use policies, mankind has enhanced a general global warming. The so-called "greenhouse effect" which is now well under way is likely to produce a temperature warming greater than any which has occurred in the past 10,000 years. While there are vast uncertainties about what will be the human responses to a CO_2-induced warmer world, important political aspects of the CO_2 problem and significant practical ways in which societies can become more resilient to climatic impacts can, in part, be identified now.

Deciding what types of political decision-making responses may be most useful and which ones might actually be undertaken is perhaps one of the more interesting, and more difficult, aspects of the CO_2 issue. For in the final analysis, the relative protection societies will have to offer future generations against CO_2-triggered socioeconomic impacts will be determined by the perceptions of and adaptations made by individuals and nations, as well as the actions of international organizations with sufficient influence to somehow control CO_2 production or initiate a well-respected "atmospheric ethic".

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