MASTER

A Global Political Systems Perspective to Climate-Society Interactions

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I. OVERVIEW

The purpose of this paper is to suggest some of the principal elements that might be useful in the development of a general theory of the climate-society interaction, to point out some of the pathways and linkages among political components involved in coping with climatic impacts, and to identify some obstacles, strategies, and incentives that apply to making policy choices related to climate.

In recent years a gradual outpouring of case studies on the socioeconomic and political consequences of climatic events (including short-term variations and slower-developing changes) has been combined with a very noticeable lack of any sustained "systems" approach to or "conceptual framework" of the overall climate-society interaction. There has been a tendency to focus on particular socioeconomic impacts and single cures, thereby neglecting the multifaceted set of interconnected elements and interactions forming the climate-society system. One reason for this is that there is no broad theoretical model that incorporates patterns of interrelated socioeconomic responses resulting from climatic impacts. A number of particular components of theoretical models of the climate system itself do exist, although they are not without shortcomings (Smagorinsky, 1974; Williams, 1978; Chervin, 1978; NAS, 1979; WMO, 1979).

The absence of a conceptual framework of analysis of the climate-society system is a potential stumbling block to developing an under-

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standing of what might be done in the future to make society more aware of and to make economic structures more resilient to climatic events. This absence creates many problems, both practical and theoretical. Only when we have a "paradigm" for understanding the ways society affects climate and vice versa can we begin to propose solutions that are preventative.

The formulation of a general climate-society system requires an identification of the subsystems affected by climatic impacts, a determination of the probabilistic influences the subsystems have upon the degree of severity of climatic impacts and vice versa, and a description of how the various subsystems interact with each other in ways that might either increase or decrease societal resiliency to climatic impacts. At the present time, however, an understanding of these features is far from complete.

Given the variety of national and international organizations involved in programs and policies concerned with climate-society interactions, it is important to establish an analytic framework for distinguishing the "principal" components of a state decision-making system. Figure 1 presents a skeleton of the total political system including in it the climatic system. While for the sake of simplicity it is not shown in the figure, it is useful to remember that all of the systems impinge upon one another. A climatic event, within the climatic system, for instance, triggers responses from the social and ecological systems. Development of social subsystems, however, will tend to increase or decrease resiliency to a given

climatic event. Overstocking of rangelands, for example, can through a series of ecological processes result in a soil moisture deficit thereby reducing the capacity of a society to cope with the climatic impact of an extended drought. The ways in which social and political subsystems affect societal resiliency to climatic events can serve as a starting point for further and more detailed analysis of the climate-society interaction.

Figure 1 Components of the Total Environment of a State Political System (after Easton, 1965).

While such an oversimplified conceptual apparatus may be helpful in identifying the place of the climatic system within the total state political environment, it does not depict how climatic impacts may reshape that environment. The bare essentials of the fundamental components and processes at work in the state political system are shown in Figure 2.

Figure 2 A Dynamic Response Model of a State Political System (after Easton, 1965).

As is apparent, the sequence of action here is stimulus-system-impact-demand/support-response-outcome. For example, increased precipitation may result in a flood which may in turn cause extensive damage to the social and economic systems of a region or nation. This may stimulate among individuals or collective groups the demand for an all encompassing flood-planning program. Making progress toward this goal, however, will involve many sensitive environmental, economic, and social issues. Proposals for a specific dam-site might result in the dislocation of communities thereby causing considerable friction between contending support groups. This will influence the processing of demands as will, to greater or lesser degrees, the decisions of authorities (e.g., executives, legislators, administrators, judges, and the like). A variety of responses may emerge through which the system will or will not seek to cope with the initial impact and interrelated consequences (feedback loop).

It is perhaps useful to point out the "political" bias of the components and interactions of this system. This overemphasis, however, may enrich our understanding of the broader context within which decisions on climate-societal issues are made.

II. SOME CONSTRAINTS ON SOCIOECONOMIC APPROACHES TO CLIMATIC IMPACTS

It is worthwhile to consider certain obstacles to our understanding, assessing, and implementing policies concerning the climate-society interaction. These include:

- A. Gaps in our understanding how the climate system works;
- B. Disciplinary barriers to multidisciplinary research;

- C. Proliferation of new political subsystems;
- D. Indeterminate focus of the level of political response;
- E. Lack of motivation for long-range planning;
- F. Limitations of quantitative approaches.

Each of these problems and complications will be discussed in turn.

- A. Gaps in our understanding how the climate system works.

For the future to be favorably influenced in regard to either preparing for, coping with, or altogether avoiding climatic impacts, it is essential that our understanding of the behavior of the climatic system itself improve significantly. To a considerable extent the process of decision-making on climate-societal issues will depend on the structuring of problems - determining the particular spatial and temporal characteristics of the problem and optimal solutions which will turn out to be optimal from the point of view of the "international community."

One approach to understanding climatic problems has been to study past climatic epochs with the view to understanding what may be expected in the future. Studies of climatic patterns that occurred between about 4,000 to 8,000 years ago (the so-called Altithermal Period) and about 200 to 400 years ago (the so-called Little Ice Age) serve as well-known examples of extended periods of different climates from the present (Kellogg, 1977; Gribbin and Lamb, 1978; Flohn, 1979). Some assessments have also been made of the socio-economic and cultural impacts of climatic variations in the past as

well as the effects of extended favorable or unfavorable climatic conditions on historical periods of "intellectual vitality" and even on the "strength of nations" (Leffingwell, 1892; Dexter, 1904; Huntington, 1915, 1919).

Clearly the formulation of past climatic analogies requires much geophysical and socioeconomic information to be useful which is very often impossible to obtain empirically, let alone to specify precisely. Further, evidence suggests that there have never been past climatic situations like those developing at present, especially climatic changes occurring as a result of increasing carbon dioxide concentrations (Kellogg, 1979).

Taking "the CO₂ problem" of a future global warming as an example,

gaps in our ability to predict the behavior of the geophysical system alone include: a) specification of the regional changes of temperature, precipitation, and soil moisture; b) delayed response due to the heat absorption capacity of ocean waters. However accurate the global average steady state projections of climatic changes from CO₂ may be, it will remain virtually impossible to determine the regional responses of social and economic systems and different levels of political interaction without first filling these gaps of understanding.

B. Disciplinary barriers to multidisciplinary research

As applied to the study and assessment of climatic impacts, economics, sociology, social psychology, history, and politics are

inextricably intertwined with each other as well as with other fields such as meteorology, geography, oceanography, glaciology, hydrology, chemistry, agronomy.

A difficult practical problem in addressing climate-social issues is the fact that members of these diverse disciplines are entering into the evaluation of climatic risks and bringing with them very different questions, assumptions, and methods (UNEP, 1978). Discipline barriers may break down but probably less rapidly than is needed for the climatic problems facing future generations (Koopmans, 1979). Yet it is impossible to make effective decisions about the implication of climatic changes and the impacts of climatic variations without drawing all of these together. The high degree of interaction among these disciplines must be accounted for and reflected in any model of the climate-society interaction. No single orientation will in itself explain the impact of social and political systems upon climatic impacts and vice versa. Ultimately, the strategies we choose to ameliorate or to cope with the impacts of climatic events will have to be the result of integrated analyses.

C. Proliferation of new political subsystems

The channels through which societal responses to climatic events are made and through which new responses can be initiated have vastly increased in the postwar years. Multinational corporations, international commodity cartels (e.g., OPEC, CIPEC), ^{Int. Council of Copper Exporting Countries} supra-national regional governmental organizations (e.g., EEC, Andean Common

Market), international non-governmental organizations (e.g., UNESCO, UNEP, WMO, ICSU, Society for International Development, International Union for Conservation of Nature and Natural Resources) and national political interest groups have ever-increasing effects on the socio-economic and political choices that are made which, in turn, influence resiliency to climatic impacts.

A breakdown of the actors in national and international political systems which will affect decision-making outputs related to climate-society interactions include the following:

- a. Individual and Group Stratum. This stratum consists of individual needs, concerns, perceptions and political lobby groups organized to promote a particular preference as to the existing government policies or plans.
- b. Regional and National Stratum. This stratum represents institutional and collective societal responses and decision-processes.
- c. Multinational Corporation Stratum. Due to the unprecedented postwar growth of Multinational Corporations (MNCs), a basic problem facing the international decision-making network is whether, and in what ways, governments can press ahead with projects aimed at reducing climatic impacts without help from MNCs.
- d. International Group Stratum. Recent years have seen a remarkable increase in international nongovernmental organizations (INGOs) acting as international pressure groups to influence the course of international - particularly environmental - activities.

- e. Regional International Stratum. Consolidation of countries represents an innovative type of political system designed to permit economies of scale, favor regional over international capital or energy development, and improve regional bargaining power vis-à-vis the international system.
- f. International Stratum. This stratum represents the highest level of the hierarchy in which decisions are made affecting local, regional, national, and international constituencies.

The input of these strata into the decision-making process can either block or allow immediate social responses or longer-term programs of action. The dynamics of interaction between the strata results from the differences in their internal structure (i.e., goals, constraints, and supply of resources), their different legitimation processes, and their divergent decision-making processes.

D. Indeterminate focus of the level of political response

Conferences on the full range of the implications that climatic events pose to human activities have brought two significant factors to the attention of governments: First, the effects of climatic impacts have come to be regarded as common global problems which know no limits of geographical boundary or political ideology. They are problems which no single country can effectively deal with on its own. Second, it will take some time for mechanisms and strategies to be developed which will mitigate the occurrence of severe climatic

- especially CO₂-induced - impacts in the future.

It is claimed by some that climatic impacts have changed the rules of the development process and created a new global context (WMO, 1979). However, it is not yet entirely clear that focusing on the global level for institutional initiatives, changes, and prescriptions is the most effective path of action. Indeed, the prospect of firm decisions and effective enforcement mechanisms at the international level for climatic change, let alone for the oceans and the outer space, is bleak (Brown, et al., 1977). While there are a number of potential international mechanisms for handling climate-related problems (such as declarations of principles, treaties, agreements, commissions of inquiry, and UN agencies) when it comes to international enforcement and assessing political and legal accountability, these instruments lack force (Weiss, 1978).

Transforming social and economic systems to adequately cope with climatic impacts might best be handled through the emerging regional supranational governmental organizations. Built up around the nucleus of political and economic structures that member states have in common, they possess a technical and legal edge over the loosely knit international community. Some of the functions of these umbrella governmental organizations include: coordinating national economic plans, improving cooperation in planning, cooperating in water conservation and construction programs, standardizing standards, and strengthening the regional supply and development of fuel and raw

materials (Galtung, 1973, Mytelka, 1979). These organizations represent only one possible decision-making source within the geopolitical map concerning climatic impacts. The opportunities these and other sources have to avert climatic changes and the consequences of climatic impacts need to be studied in terms of:

- improvements that can be achieved without new institutions and large capital expenditures;
- improvements that could be achieved with new environmental projects, and the cost of such measures;
- steps already taken, plans still in the pipeline, timetables for achieving any improvement, and results of such actions.

E. Lack of motivation for long-range planning

Long-range planning initiates the process of turning goals and aspirations into political realities. Unfortunately deep psychological and political difficulties usually seem to bar the way to really satisfactory long-term planning. The crucial questions for anyone making a long-range decision seem to come down to the following:

To what lengths should one go, and what sacrifices should one accept, to secure against contingencies which may or may not occur? The demands of the present may have to be sacrificed to the needs of the future, but how much is expedient to sacrifice without certainty about the future? Finally, how much real concern will the "body politic" feel for the welfare of future generations?

In addition, there may be a difficulty in establishing a viable process whereby the pursuit of long-range planning can be permanently

coupled to the agencies that will carry it out. Attempts to establish such a process, especially in developed market economies, seem to have failed, except where very specific facilities are involved, such as dams, power plants, managed forests, etc.

Intergeneration decision-making with regard to climatic changes deserves careful analysis. It gives rise to some important questions. How can climate-triggered socioeconomic disasters be averted? Can a signal-to-noise danger level be specified? With regard to impending CO₂ global warming, how great must the temperature increase be to produce ecocatastrophes?

To a limited extent, it appears that the capability of looking at climatic events and consequent socioeconomic impacts from a long-term perspective - that is, by taking carefully into account how long-term planning can avert costly monetary expenditures in capital, relief and reconstruction, social dislocation, and personal loss of life and property - is gaining more adepts. Indeed, the WMO's Climate Data and Climate Applications Programs in addition to the Climate Impacts Study Program established under the WCP, were designed to meet these kinds of needs.

Unfortunately, it is only too clear that geophysicists (and a growing number of social scientists) have been most helped in their efforts by short-term climatic events whose impacts have severely affected social and economic systems. Much remains to be done in carefully analyzing the basic factors which impede long-range planning, such as lack of information, lack of planning organizations, institutional inertia, mass-media selling fears, and individual

future discounts.

F. Limitations of quantitative approaches

Assessments of the socioeconomic consequences of climatic change must be especially careful to take into account primary and secondary consequences, short-term and long-term effects, regional and global impacts, as well as discreet and continuous impacts. Some effects are directly quantifiable, such as grain crop yields. Some effects on human behavior are only partially quantifiable, such as the loss of income due to disease. Still other very significant effects of climatic events are unquantifiable, such as population relocation difficulties.

The glaring omission of cultural factors and norms, political objectives, environmental constraints, and resources is a serious deficiency of present computer models and benefit/cost analyses. If one takes the objective of systems analysis or benefit/cost analysis to be to assist decision-making (not to make decisions nor to justify past policies) the absence of such often incommensurable criteria makes them less credible and hence less useful in the search for new policy alternatives and the way to attain these alternatives.

There is, to be sure, a growing tendency to recognize that the consequences and values of a given climatic impact cannot be adequately measured in economic terms alone. What is being recognized is that qualitative factors, such as clean air, water, adequate food provisions, health, preserving threatened species, and nature itself, have considerable value that cannot be adequately expressed in terms of mathematical formulations. (Kellogg and Mead, 1976; U. N. Conference on the Human Environment, 1972). A key factor in future assessments of the climate-society interaction will be to set up guidelines for

evaluating the quality of climate impact projects. Linked with this will be the need for qualitative evaluations of assistance projects for those regions and countries hit the hardest by climatic impacts: projects that are technically, socially, and politically acceptable.

So far as the crucial needs of the climatological services of developing countries are concerned, Sah (1979) suggests, at minimum, the following: "trained personnel, data collection, adaptation of the techniques of analysis to suit local conditions, data analysis for specific purposes, experimental applications and the routine communication of useful results."

In view of the rapid "modernization" process at work in developing countries, including deforestation, urban building, and the breaking of dominance-submission relations with colonial countries, combined with the rapidly increasing use of fossil fuels in developed countries, it is essential to understand the "thresholds of tolerance" peculiar to climate-social interactions. Put another way, quantitative growth must be carefully managed in the light of qualitative requirements, beyond which the absorptive or resilient capacities of the system are trespassed upon and unforeseeable consequences follow. These limits on the scale of development of social and economic systems - for example, credit and capital distribution, large-scale production arrangements, and national bureaucracies - have particular relevance when applied to "marginal" populations in developing countries (Baird, 1975). In these countries even "minor" climatic variations have been known to trigger wide and, too often, disastrous sequence of socioeconomic impacts.

III. GUIDELINES FOR INCREASING POLITICAL AND SOCIOECONOMIC RESILIENCE TO CLIMATIC IMPACTS

A main task of climate-society modeling should be to probe the general processes increasing resilience to climatic impacts. How is any given social or economic system best able to cope with climatic "stresses" that disrupt the status quo of the polity and threaten the persistence of the systems?

Generally speaking, developing economies and marginal or semi-arid ecological zones are relatively more susceptible to severe socioeconomic impacts from climatic variations. Where average levels of living are low, conditions of existence often precarious, disease and illiteracy widespread, and poor colonial planning commonplace, resilience to climatic change and unforeseen variations is minimal (Kates, 1979; Glantz, 1977; Baird, 1975; Oguntuyinbo and Odingo, 1979).

We can, however, set up guiding principles for increasing societal resilience to climatic impacts. It is apparent that all societies, regardless of political ideology, level of economic production, and cultural development, will be increasingly more resilient to climatic impacts in general and to a CO₂-induced warming in particular if the following conditions are at least partially met:

- a. A society recognizes the problem of increased CO₂ production and climate change, and takes it seriously enough to be considered in the political process.

- b. A society provides for forward budget planning, and undertakes long-range planning covering a wide range of physical, political, social, and economic eventualities.
- c. A society plans for both short-term (e.g., disaster relief) and long-term (e.g., economic conversions) changes.
- d. A society has access to contemporary, usable climate data for planning of agriculture, land-use, power plants, water resource development, and so forth.
- e. A society plans and implements preventative and adjustment activities such as warning systems, dissemination of forecasts, and water control works.
- f. A society maintains food reserves held in readiness for future contingencies.
- g. A society's governing elite has the will to enter into and respect international agreements.
- h. A society modifies its priorities and goals wherever neighboring nations' priorities and goals are in conflict.
- i. A society's cultural standards and expectations tend toward diversity.
- j. A society has set up institutions or related government departments designed to mitigate and control domestic CO₂ emissions, but only with prior international agreement.

From the practical point of view the essence of the problem is that modes of resiliency to climatic impacts exist not in isolation, by themselves, but only within a total state political system. Although optimal for climate-related problems, the above conditions,

if met, would most likely turn out to be optimal from the point of view of other subsystems.

The point that many strategies related to coping with climatic impacts might support other environmental and developmental objectives should be strongly emphasized. Thus climate-related policies can increasingly be viewed in terms of reinforced motivations to get policy-makers to do what they should (and may want to) do anyway. A few examples of reinforced incentives for dealing with the growing atmospheric accumulation of CO₂ include:

- Proposals for reforestation and the management of forests in developing countries would further decrease the amount of carbon released into the atmosphere and, at the same time, improve ecosystems and economies (Woodwell et al., 1978; AID, 1976; Spurgeon, 1979).
- Proposals for interdisciplinary research on the CO₂ problem would help to develop broad-based policies and would also help to break down some of the long-established barriers separating disciplines (UNEP, 1978).
- Proposals for increasing public awareness of the consequences of releasing large amounts of CO₂ into the atmosphere would "piggy-back" efforts to increase public participation at the decision-making stages of generating alternative strategies to fossil fuel usage.
- Proposals for better understanding the regional issues at stake in the CO₂ problem can help "self-reliant" develop-

ment, suited to local conditions, values, and needs of developing countries.

system.

- AID, 1976: Tax incentives for reforestation. Development Digest, Gordon Donald (ed.), XIV, 1, January, Washington, D.C., 19-24.
- Baird, A. et al., 1975: Towards an explanation of disaster proneness. University of Bradford, Disaster Research Unit Occasional Paper No. 10, Bradford, England.
- Brown, Seyom, Cornell, Nina W., Fabian, Larry L., and Weiss, Edith Brown, 1977: Regimes for the Ocean, Outer Space, and Weather. The Brookings Institution, Washington, D.C.
- Chervin, Robert M., 1978: The limitations of modelling: the question of statistical significance. Climatic Change, John Gribbin (ed.), Cambridge University Press, London.
- Dexter, G. 1904: Weather Influences: An Empirical Study of the Mental and Physiological Effects of Definite Meteorological Conditions. MacMillan, New York.
- Easton, David, 1965: A Systems Analysis of Political Life. John Wiley and Sons, New York.
- Flohn, H., 1979: A scenario of possible future climates: Natural and man-made. Proc. of the World Climate Conference, WMO No. 537, February, Geneva, 243-266.
- Galtung, John, 1973: The European Community: A Superpower in the Making. George Allen and Unwin, London.
- Glantz, Michael H., 1977: Case studies: Water and inappropriate technology: Deep wells in the Sahel. J. Intl. Law and Policy, 6, 527-540.
- Gribbin, John, and Lamb, H. H., 1978: Climatic change in historical times, Climatic Change, John Gribbin (ed.), Cambridge University Press, London.
- Huntington, Ellsworth, 1915: Civilization and Climate. Yale University Press, New Haven.
- Huntington, Ellsworth, 1919: World Power and Evolution. Yale University Press, New Haven.
- Kates, Robert W., 1979: Climate and society: Lessons from recent events. Proc. of the World Climate Conference, WMO No. 537, February, Geneva, 682-691.
- Kellogg, William W., and Mead, Margaret M. (eds.), 1976: The Atmosphere: Endangered and Endangering. Fogarty International Center Proceedings No. 39, HEW, Washington, D.C.

- Kellogg, William W., 1977: Effects of human activities on global climate. WMO Tech. Note No. 156, WMO No. 486, Geneva.
- Kellogg, William W., 1979: Influences of mankind on climate. Ann. Rev. Earth Planet Sci., 7, 63-92.
- Koopmans, Tjalling C., 1979: Economics among the sciences. The American Economic Review, 69, 1, March, 1-13.
- Leffingwell, Albert, 1892: Illegitimacy and the Influence of Seasons upon Conduct. Sonnenschein, London.
- Mytelka, Lynn Krieger, 1979: Regional Development in a Global Economy: The Multinational Corporation, Technology, and Andean Integration. Yale University Press, New Haven.
- NAS, 1979: Carbon Dioxide and Climate: A Scientific Assessment. Report of ad hoc Study Group on Carbon Dioxide and Climate, Woods Hole, Mass., July, Climate Research Board, National Academy of Sciences, Washington, D.C.
- Oguntuyinbo, Julius S. and Odingo, Richard S., 1979: Climatic variability and land use: An African perspective. Proc. of the World Climate Conference, WMO No. 537, February, Geneva, 552-580
- Sah, Raas, 1979: Priorities of LDCs in Weather and Climate. Economic Research Unit, University of Pennsylvania.
- Smagorinsky, J., 1974: Global atmospheric modelling and numerical simulation of climate. Weather and Climate Modification, W. N. Hess (ed.), John Wiley and Sons, New York.
- Spurgeon, David, 1979: Growing food in the forests. UNITERRA, UNEP, 4, 6, August, Kenya, 4-5.
- UNEP, 1978: Environment and Development and Environmental Management. Report of the Executive Director No. 3, Kenya, April.
- United Nations Conference on the Human Environment, 1972: Declaration on the Human Environment. Stockholm, June.
- WMO, 1979: Report of ad hoc Working Group on Climatic Effects of Increased Carbon Dioxide. October, Boulder, Colorado.
- WMO, 1979: The declaration of the world climate conference. Proc. of the World Climate Conference, WMO No. 537, February, Geneva, 709-716.

Williams, Jill, 1978: The use of numerical models in studying climatic change. Climatic Change, John Gribbin (ed.), Cambridge University Press, London.

Weiss, Edith Brown, 1978: International Liability and Weather Modification, Climatic Change 1, 3, 267-290.

Woodwell, G. M. et al., 1978: The biota and the world carbon budget. Science, 199, January, 141-146.